PowerFlex SCR Bus Supply

Allen-Bradley

Firmware Version 1.xxx

User Manual

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. *Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls* (Publication SGI-1.1 available from your local Rockwell Automation sales office or online at **http://www.rockwellautomation.com/literature**) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

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Throughout this manual, when necessary we use notes to make you aware of safety considerations.

WARNING: Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.

Important: Identifies information that is critical for successful application and understanding of the product.

ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequences.

Shock Hazard labels may be located on or inside the equipment (e.g., drive or motor) to alert people that dangerous voltage may be present.

Burn Hazard labels may be located on or inside the equipment (e.g., drive or motor) to alert people that surfaces may be at dangerous temperatures.

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The information below summarizes the changes made to this manual since its last release (March 2011):

Description of Changes	Page
In Chapter 1 in the "1000A SCR Bus Supply Flexibility" section:	
• Added information and a table at the beginning to show which conversions are possible and which are not possible.	1-16
• In the "Converting Master Unit to Slave Unit" subsection, added new steps 3 and 4.	1-16
• Deleted subsection "Converting Slave Unit to Master Unit" subsection.	
In Appendix A in the "Accessories" section:	
• Changed Table A.A cat. numbers for rows 256…509, and added new row for 939…1K0.	A-7
• Changed Table A.B cat. numbers for rows 256…509, and added new row for 939…1K0.	A-8
• Changed Table A.C cat. numbers for rows 256…509, and added new row for 939…1K0.	A-9
• Changed Table A.D cat. numbers for rows 256…509, and added new row for 939…1K0.	A-10
In Appendix A in the "HF Filter" section:	
• Added new HF Filter Wiring Diagram Figure A.5.	A-11
• Added new subsection "Solid Ground Systems."	A-12
• Added new subsection "Non-Solid Ground Systems."	A-12
In Appendix A in the "Spare Parts" section:	
• Added Important statement above Figure A.8.	A-14
• Added new "Availability" column to Table A.E	A-15
• Added Important statement above Figure A.9.	A-16
• Added new "Availability" column to Table A.F	A-17
• Added Important statement above Figure A.10.	A-18
• Added new "Availability" column and new footnote 1 to Table A.G	A-19
• Added new Figure A.11 to show locations of precharge and gate drive boards for 1000A unit.	A-19
In Appendix A, revised Input Ratings "Operational AC Input Voltage Range" for catalog number 20SF1K0… from "269…759V" to "528…759V."	A-1
Added new Appendix B.	B-1

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Appendix B **History of Changes**

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Overview

The purpose of this manual is to provide you with the basic information needed to install, start up, and troubleshoot the PowerFlex SCR Bus Supply.

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Who Should Use this Manual?

This manual is intended for personnel that are qualified to install, program, and operate adjustable frequency drives and their use in common DC bus systems.

Reference Documentation

General Drive Information

Title	Publication
Wiring and Grounding Guidelines for PWM AC Drives	DRIVES-IN001
AC Drives in Common Bus Configurations	DRIVES-AT002
Preventive Maintenance of Industrial Control and Drive System Equipment	DRIVES-TD001
Safety Guidelines for the Application, Installation and Maintenance of Solid State Control	SGI-1.1
A Global Reference Guide for Reading Schematic Diagrams	0100-2.10
Guarding Against Electrostatic Damage	8000-4.5.2
1321 Power Conditioning Products Technical Data	1321-TD001

Specific Drive Information

For detailed drive information, including specifications, refer to the following PowerFlex 70, PowerFlex 700, PowerFlex 700H, PowerFlex 700S, and PowerFlex 750-Series drive publications.

For:	Refer to:	Publication
PowerFlex® 70/70EC Drive	PowerFlex 70 User Manual PowerFlex 70/700 Reference Manual PowerFlex 70EC/700VC Reference Manual	20A-UM001 PFLEX-RM001 PFLEX-RM004
PowerFlex® 700/700VC Series A Drive PowerFlex® 700VC Series B Drive	PowerFlex 700 Series A User Manual PowerFlex 700 Series B User Manual PowerFlex 70/700 Reference Manual PowerFlex 70EC/700VC Reference Manual	20B-UM001 20B-UM002 PFLEX-RM001 PFLEX-RM004

For:	Refer to:	Publication
PowerFlex® 700H Drive	PowerFlex 700H Installation Instructions PowerFlex 700H Programming Manual	PFLEX-IN006 20C-PM001
PowerFlex® 700S Drive	PowerFlex 700S with Phase I Control Installation Manual (Frames 1…6) PowerFlex 700S with Phase I Control Installation Manual (Frames 9 and 10) PowerFlex 700S with Phase I Control User Manual (All Frame Sizes) PowerFlex 700S with Phase I Control Reference Manual PowerFlex 700S with Phase II Control Installation Manual (Frames 1…6) PowerFlex 700S with Phase II Control Installation Manual (Frames 9…14) PowerFlex 700S with Phase II Control Programming Manual (All Frame Sizes) PowerFlex 700S with Phase II Control Reference Manual	20D-IN024 PFLEX-IN006 20D-UM001 PFLEX-RM002 20D-IN024 PFLEX-IN006 20D-PM006 PFLEX-RM003
PowerFlex® 750-Series AC Drive	PowerFlex 750-Series Drive Installation Instructions PowerFlex 750-Series Drive Programming Manual PowerFlex 750-Series Reference Manual	750-IN001 750-PM001 750-RM002

Documentation can be obtained online at http://literature.rockwellautomation.com. To order paper copies of technical documentation, contact your local Rockwell Automation distributor or sales representative.

To find your local Rockwell Automation distributor or sales representative, visit www.rockwellautomation.com/locations.

For information such as firmware updates or answers to drive-related questions, go to the Drives Service & Support web site at www.ab.com/support/abdrives and click on the “Downloads” or “Knowledgebase” link.

Rockwell Automation Support

Use the contacts below for PowerFlex SRC Bus Supply technical support.

Online…	By Email…	By Telephone…
www.ab.com/support/abdrives	support@drives.ra.rockwell.com	262-512-8176

Conventions Used in This Manual

- In this manual we may refer to the PowerFlex SCR Bus Supply as SCR Bus Supply or Bus Supply.
- The firmware release is displayed as FRN X.xxx. The “FRN” signifies Firmware Release Number. The “X” is the major release number. The “xxx” is the minor update number.
- The following words may be used throughout the manual to describe an action:

Word	Meaning
Can	Possible, able to do something
Cannot	Not possible, not able to do something
May	Permitted, allowed
Must	Unavoidable, you must do this
Shall	Required and necessary
Should	Recommended
Should Not	Not Recommended

General Precautions

ATTENTION: This Bus Supply contains ESD (Electrostatic Discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing or repairing this assembly. Component damage may result if ESD control procedures are not followed. If you are not familiar with static control procedures, refer to Allen-Bradley publication 8000-4.5.2, “Guarding Against Electrostatic Damage” or any other applicable ESD protection handbook.

ATTENTION: An incorrectly applied or installed Bus Supply can result in component damage or a reduction in product life. Wiring or application errors, such as incorrect or inadequate AC supply, or excessive ambient temperatures may result in malfunction of the system.

ATTENTION: Only qualified personnel familiar with adjustable frequency AC drives and associated machinery should plan or implement the installation, start-up and subsequent maintenance of the system. Failure to comply may result in personal injury and/or equipment damage.

ATTENTION: Connect products with or without precharge circuitry to the SCR Bus Supply common bus output terminals within the minimum and maximum capacitance and load rating guidelines.

ATTENTION: To avoid an electric shock hazard, verify that the voltage on the DC bus terminals (which are connected to the DC bus capacitors of the Inverter) has discharged before performing any work on the Bus Supply. Measure the DC bus voltage at the +DC and -DC output terminals. The voltage must be zero.

ATTENTION: A second source of power for the cooling blower is present. To avoid an electric shock hazard or moving blades, verify that the AC power supply has been removed prior to performing any maintenance or repairs.

ATTENTION: National Codes and standards (NEC, VDE, BSI, etc.) and local codes outline provisions for safely installing electrical equipment. Installation must comply with specifications regarding wire types, conductor sizes, branch circuit protection, and disconnect devices. Failure to do so may result in personal injury and/or equipment damage.

Catalog Number Explanation

Position Number

1-3	*4*	*5-7*	*8*	*9*	*10*
20S	**D**	**400**	**N**	**E**	**N**
a	*b*	*c*	*d*	*e*	*f*

a

Product	
Code	**Type**
20S	PowerFlex SCR Bus Supply

b

Voltage Rating			
Code	**Input Voltage**	**Phase**	**DC Output**
D	400/480V AC	3	540 - 650V DC
F	600/690V AC	3	675 - 930V DC

c

Current Rating	
Code	**Output**
400	400A, 400/480V
600	600A, 400/480V
1k0	1000A, 400/480/600/690V

d

Enclosure		
Code	**Rating**	**Conformal Coating**
N	Open / IP00	No

e

Documentation & Shipping Carton		
Code	**User Manual**	**Carton**
E	English	Yes

f

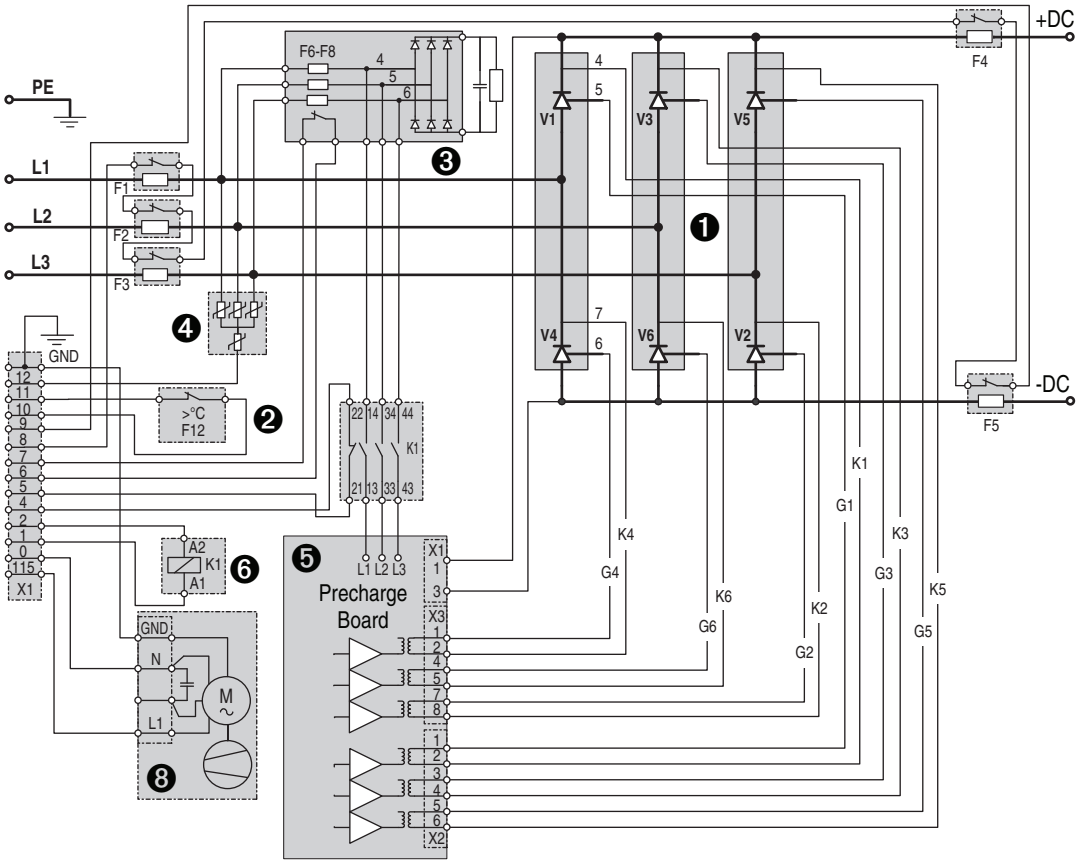
Configuration	
Code	**Type**
N	Stand Alone
M	Master (1000A only)
S	Slave (1000A only)

Important: PowerFlex SCR Bus Supply 1000A units with Master or Slave configuration are available for 400/480 and 600/690 Volts.

Descriptions and Schematic Diagrams

The SCR Bus Supply is a single-direction power converter for the front end of common DC bus drive systems. It converts the incoming 3-phase AC line voltage to a common DC bus voltage.

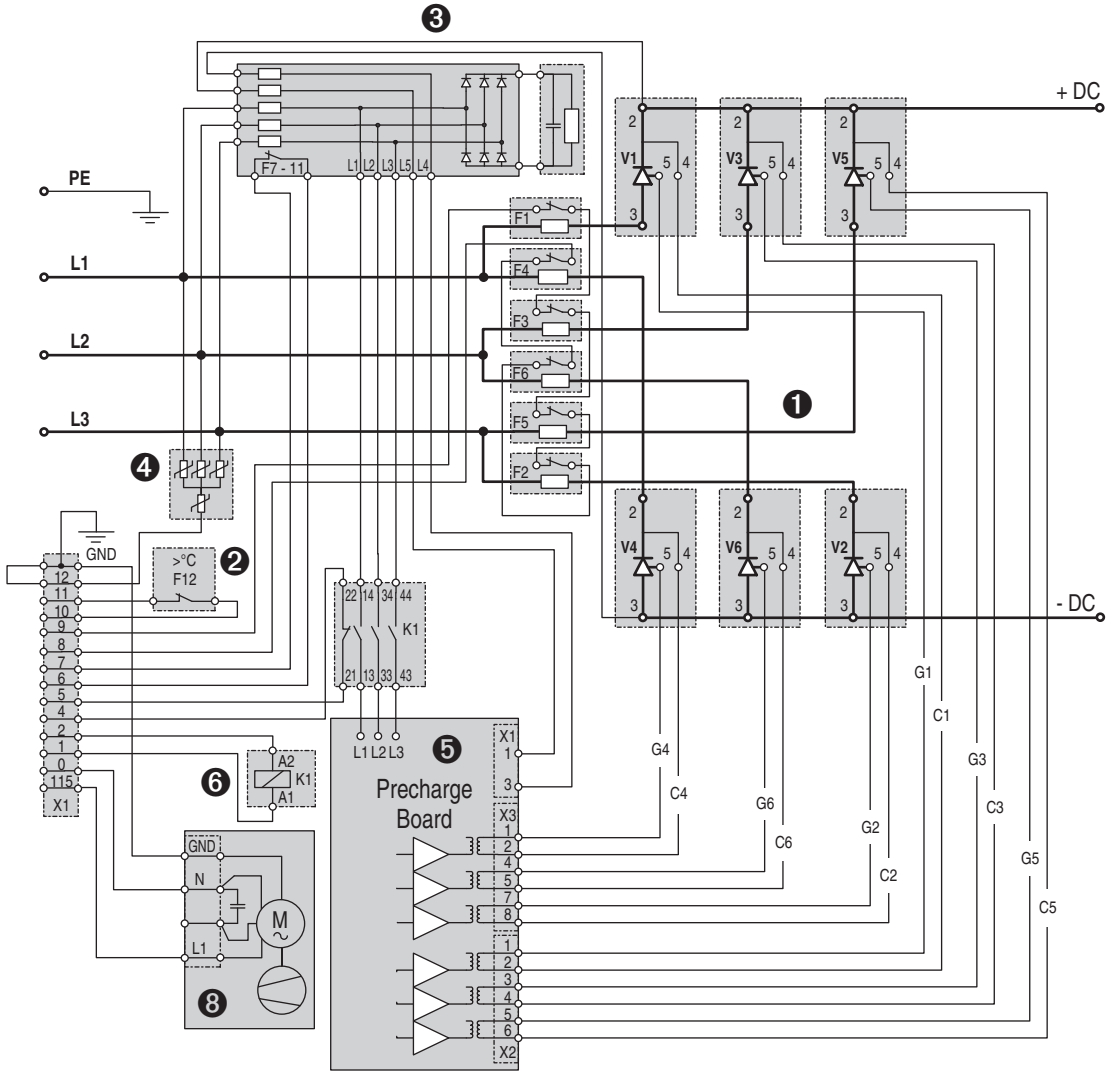
Figure P.1 400A and 600A SCR Bus Supply Schematic Diagram



The primary electrical components for the 400A and 600A SCR Bus Supply are:

Item	Description
❶	**Six-Pulse, Full-Wave, 3-Phase SCR Bridge Rectifier Unit** connected to the line input and DC Bus output terminals through **semi-conductor protection fuses** with trip indicator switches.
❷	**Bus Supply Overtemperature Sensor** located on the heat sink for thermal protection of the SCR bridge rectifier.
❸	**RC snubber circuit** routed to the three input phases through **semi-conductor protection fuses** with trip indicator switches.
❹	**MOV snubber circuit** routed to the three input phases.
❺	**Precharge Board**
❻	**Enable Contactor** (K1) for the precharge board.
❽	**Cooling Blower** connected to a customer-supplied 115V AC Power Supply. The customer's controls must, at a minimum, command the blower to run whenever contactor K1 is enabled.

Figure P.2 1000A SCR Bus Supply Single Unit Schematic Diagram

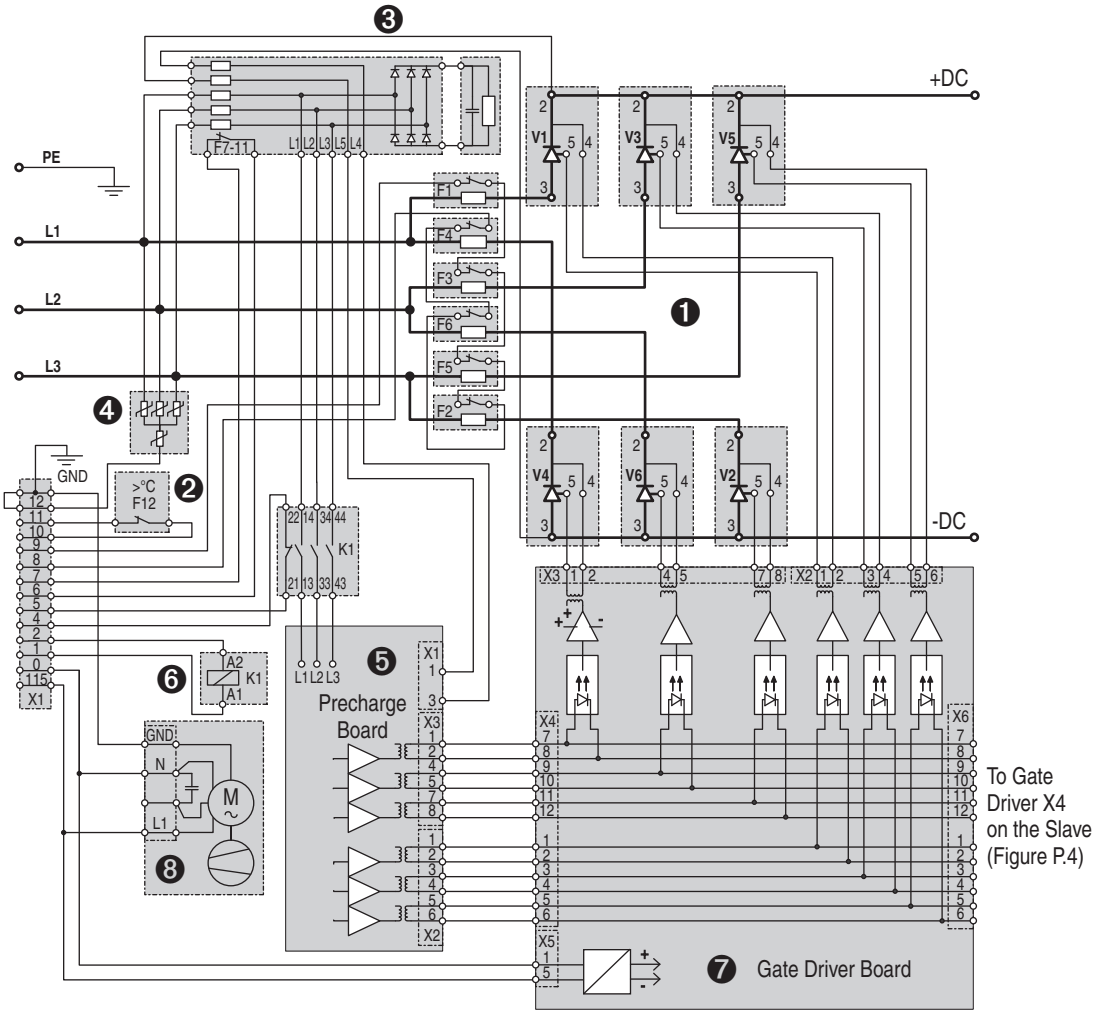


The primary electrical components for the 1000A SCR Bus Supply Single Unit are:

Item	Description
❶	**Six-Pulse, Full-Wave, 3-Phase SCR Bridge Rectifier Unit** connected to the line input and DC Bus output terminals through **semi-conductor protection fuses** with trip indicator switches.
❷	**Bus Supply Overtemperature Sensor** located on the heat sink for thermal protection of the SCR bridge rectifier.
❸	**RC snubber circuit** routed to the three input phases through **semi-conductor protection fuses** with trip indicator switches.
❹	**MOV snubber circuit** routed to the three input phases.
❺	**Precharge Board**
❻	**Enable Contactor** (K1) for the precharge board.
❽	**Cooling Blower** connected to a customer-supplied 115V AC Power Supply. The customer's controls must, at a minimum, command the blower to run whenever contactor K1 is enabled.

NOTE: There is no DC output fuse protection in the 1000A SCR unit.

Figure P.3 1000A SCR Bus Supply Master Unit Schematic Diagram

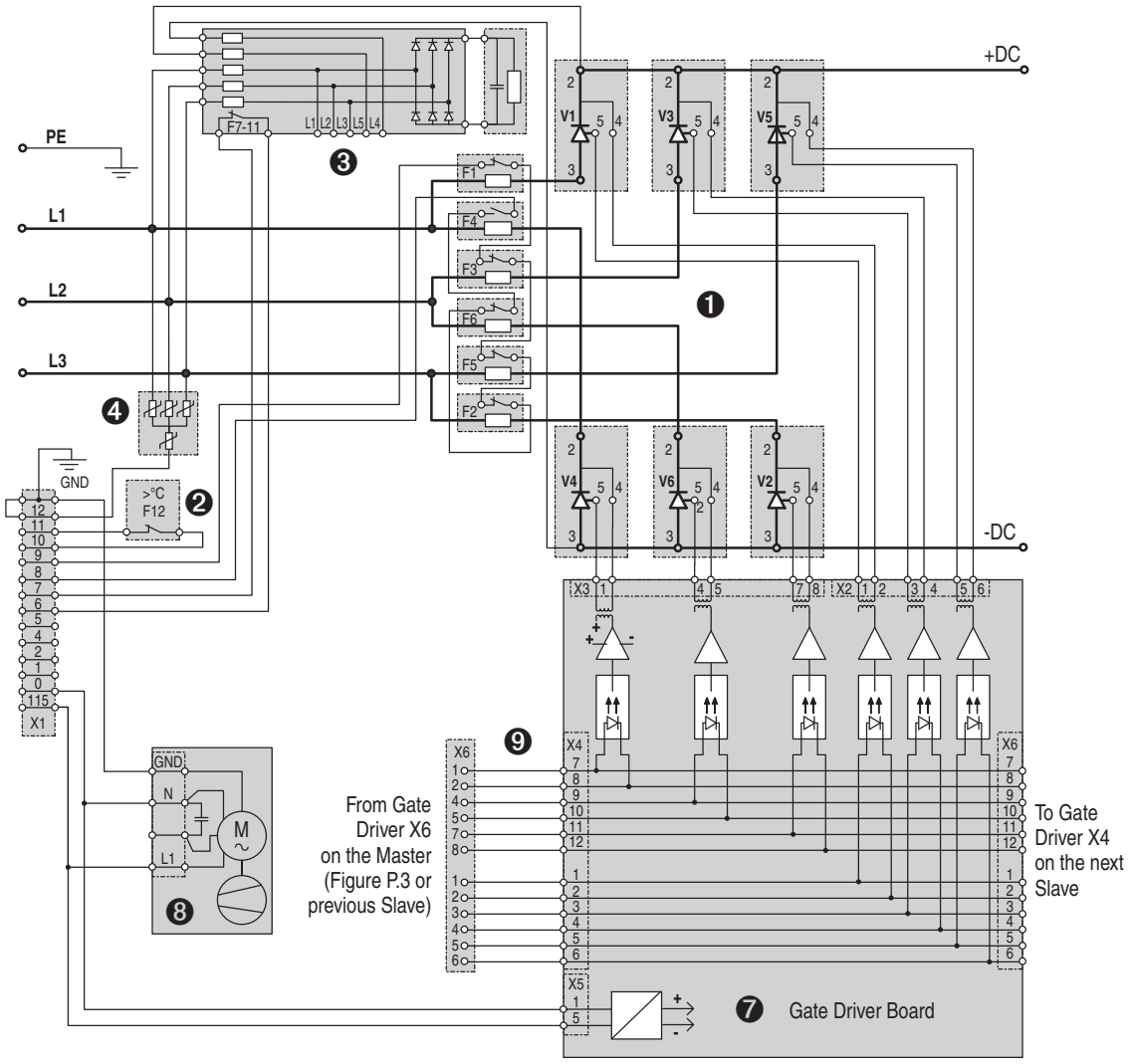


The primary electrical components for the 1000A SCR Bus Supply Master Unit are:

Item	Description
❶	**Six-Pulse, Full-Wave, 3-Phase SCR Bridge Rectifier Unit** connected to the line input and DC Bus output terminals through **semi-conductor protection fuses** with trip indicator switches.
❷	**Bus Supply Overtemperature Sensor** located on the heat sink for thermal protection of the SCR bridge rectifier.
❸	**RC snubber circuit** routed to the three input phases through **semi-conductor protection fuses** with trip indicator switches.
❹	**MOV snubber circuit** routed to the three input phases.
❺	**Precharge Board**
❻	**Enable Contactor** (K1) for the precharge board.
❼	**Gate Driver Board.** The DC power supply is connected to a customer-supplied 115V AC Power Supply.
❽	**Cooling Blower** connected to a customer-supplied 115V AC Power Supply. The customer's controls must, at a minimum, command the blower to run whenever contactor K1 is enabled.

NOTE: There is no DC output fuse protection in the 1000A SCR unit.

Figure P.4 1000A SCR Bus Supply Slave Unit Schematic Diagram



The primary electrical components for the 1000A SCR Bus Supply Slave Unit are:

Item	Description
❶	**Six-Pulse, Full-Wave, 3-Phase SCR Bridge Rectifier Unit** connected to the line input and DC Bus output terminals through **semi-conductor protection fuses** with trip indicator switches.
❷	**Bus Supply Overtemperature Sensor** located on the heat sink for thermal protection of the SCR bridge rectifier.
❸	**RC snubber circuit** routed to the three input phases through **semi-conductor protection fuses** with trip indicator switches.
❹	**MOV snubber circuit** routed to the three input phases.
❼	**Gate Driver Board.** The DC power supply is connected to the customer-supplied 115V AC Power Supply.
❽	**Cooling Blower** connected to a customer-supplied 115V AC Power Supply. The customer's controls must, at a minimum, command the blower to run whenever contactor K1 is enabled.
❾	**Connection Cable** (1 m) connects the gate firing pulses from the Master to the first Slave or between any two Slaves (maximum 4).

NOTE: There is no DC output fuse protection in the 1000A SCR Unit.

Installation/Wiring

This chapter provides information on the installation and wiring of the PowerFlex SCR Bus Supply.

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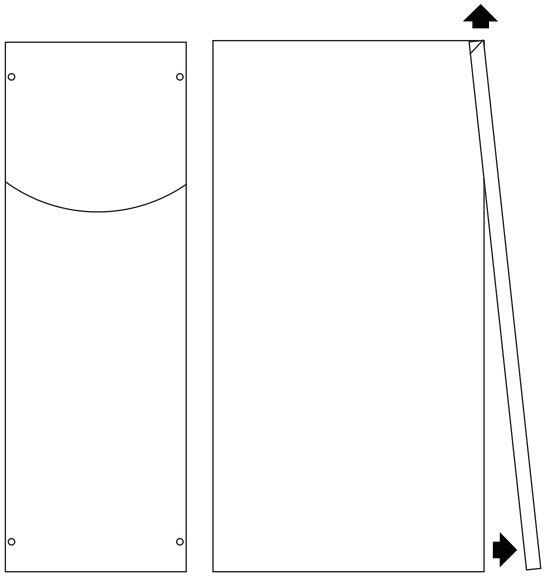
Most start-up difficulties are the result of incorrect wiring. Every precaution must be taken to assure that the wiring is done as instructed. All items must be read and understood before the actual installation begins.

ATTENTION: The following information is merely a guide for proper installation. Rockwell Automation, Inc. cannot assume responsibility for the compliance or the noncompliance to any code, national, local or otherwise for the proper installation of this product or associated equipment. A hazard of personal injury and/or equipment damage exists if codes are ignored during installation.

Opening the Cover

1. Remove the four fastening screws. (The steel sheet cover will stay in place, even in the vertical position.)
2. Hold the cover with both hands at the bottom, and lift it upward about 2 cm (0.8 in.) and away from the enclosure (Figure 1.1).

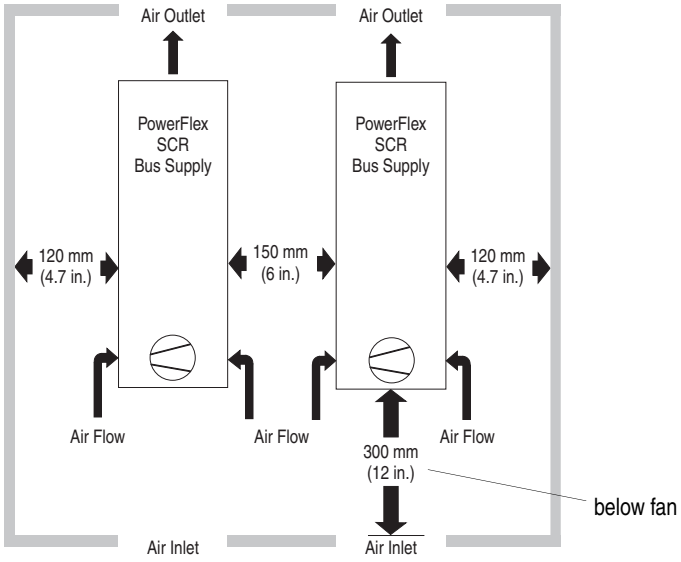
Figure 1.1 Opening the Cover



Minimum Mounting Clearances

The cabinet air inlet and outlet areas for each SCR Bus Supply must be a minimum of 200 cm^2 (31 $in.^2$). The length-to-width ratio must not exceed 4:1.

Figure 1.2 Mounting Clearances



Refer to Appendix A for detailed dimension information.

Ambient Operating Temperatures

The PowerFlex SCR Bus Supply is designed to operate at 0…40 °C (32…104 °F) ambient without derating. For operation in ambients above 40 °C up to 50 °C (104 °F up to 122 °F), the PowerFlex SCR Bus Supply output Amps must be derated by 1.2% per 1 °C for 400A unit, and by 1.0% per 1 °C for 600A and 1000A units.

Ensure that proper cooling is provided to the SCR Bus Supply to maintain the 40 °C rated specification. If the ambient temperature is exceeded, apply the proper derate factors. Add exhaust fans to the front or top of the enclosure bay and provide a filtered opening at the bottom of the cabinet bay.

The SCR Bus Supply watt losses (from specification section) are 1200W at 400A, 1600W at 600A, 2700W at 480V 1000A, and 2800W at 690V 1000A. The three-phase AC line reactor watt losses are listed in the 1321 Power Conditioning Products Technical Data (publication 1321-TD001).

Because of the internal design of the SCR Bus Supply, it is NOT recommended to rely on an air dam surrounding the SCR Bus Supply.

It is recommended that the system integrator completes a thermal evaluation to ensure adequate cooling to maintain proper operating conditions for each cabinet or bay. A minimum air exchange of 725 CFM per SCR Bus Supply is recommended.

AC Supply Source Considerations

The PowerFlex SCR Bus Supply is suitable for use on a circuit capable of delivering a short circuit rating up to a maximum of 85,000 rms symmetrical amperes.

If a Residual Current Detector (RCD) is used as a system ground fault monitor, only Type B (adjustable) devices should be used to avoid nuisance tripping.

Line Reactors

A minimum 3% rated three-phase AC line reactor must be installed for minimum voltage drop unless the closest supply transformer is matched to the kVA rating of the PowerFlex SCR Bus Supply. For recommended line reactors, see Line Reactors on page A-7.

Install one three-phase AC line reactor for each SCR Bus Supply module. It is recommended to maintain cable length symmetry between the three-phase AC line reactors and the SCR Bus Supply connections. One method is to mount the three-phase AC line reactors on the cabinet floor under the SCR Bus Supply.

Important: It is recommended to keep all wired or bus bar connections identical in size and length. This includes the AC line connection to the three-phase AC line reactors and from the three-phase AC line reactors to the SCR Bus Supply.

Unbalanced or Non-Solid Grounded Distribution Systems

Where the potential exists for abnormally high phase-to-ground voltages (in excess of 125% of nominal), or the supply system is non-solid grounded, refer to the *Wiring and Grounding Guidelines for Pulse Width Modulated (PWM) AC Drives* (publication DRIVES-IN001).

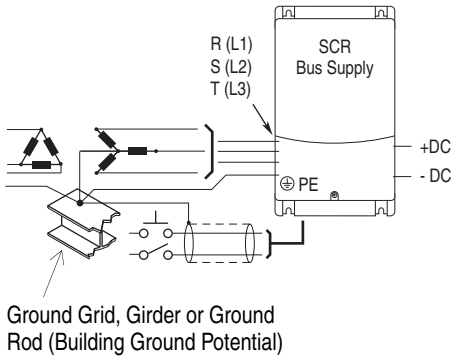
ATTENTION: The PowerFlex SCR Bus Supply contains protective MOVs that are referenced to ground. The MOVs should be disconnected from ground if the SCR Bus Supply is installed on any non-solid grounded power distribution system (IT-network). For jumper location, see Figure 1.7 on page 1-11.

General Grounding Requirements

The Safety Ground terminal (PE) must be connected to the building grounding scheme. Ground impedance must conform to the requirements of national and local industrial safety regulations and/or electrical codes. The integrity of all ground connections should be periodically checked.

For installations within a cabinet, a single safety ground point or ground bus bar connected directly to building steel should be used. All circuits including the AC input ground conductor should be grounded independently and directly to this point/bar.

Figure 1.3 Typical Grounding



Safety Ground Terminal - PE

The Bus Supply safety ground (PE) must be connected to the customer grounding scheme or earth ground. This is the safety ground for the Bus Supply that is required by code. This point must be connected to adjacent building steel (girder, joist), a floor ground rod, bus bar or building ground grid. Grounding points must comply with national and local industrial safety regulations and/or electrical codes.

RFI Filter Grounding

Using an external RFI filter may result in relatively high ground leakage currents. Therefore, the **filter must only be used in installations with grounded AC supply systems and be permanently installed and solidly grounded** (bonded) to the building power distribution ground. Ensure that the incoming supply neutral is solidly connected (bonded) to the same building power distribution ground. Grounding must not rely on flexible cables and should not include any form of plug or socket that would permit inadvertent disconnection. Some local codes may require redundant ground connections. The integrity of all connections should be periodically checked. Refer to the instructions supplied with the filter.

Minimum Capacitance

In order to commission and test the SCR Bus Supply, a minimum capacitance is required. The design of the final installation must assure that the minimum capacitance is connected whenever the bus supply is to be enabled. If this minimum capacitance is not present, the bus supply internal fault detection circuit will interpret the condition as a DC bus short and stop pulse firing. The minimum capacitance (110 µF per SCR bus supply) may be provided by an external capacitor bank (recommended) or a drive (as long as the drive remains connected to the DC bus). **NOTE:** A capacitance of 110 µF is typical of a 5 HP or 3.7 kW drive. To find DC bus capacitances for specific PowerFlex drives, refer to Appendix A tables in the *PowerFlex AC Drives in Common Bus Configurations Application Guidelines* (publication DRIVES-AT002).

Maximum Loading

To avoid overloading the Bus Supply, the following requirement applies:

> The DC Input current sum (Normal Duty rating at 40 °C/104 °F) of the connected drive(s) must not exceed the Bus Supply continuous DC Bus output current rating.

For the DC Input Current values of the drives, see tables in the respective drive documentation.

Table 1.A and Table 1.B provide guidance on the nominal operation of the SCR Bus Supply. No overload capability is built into the tables.

Important: See "Output Ratings" in Appendix A for overload capability.

When an overload is being utilized in connected drives or products, that overload current must be accounted for in the calculation to properly size the SCR Bus Supply.

Table 1.A Normal Duty ND (110%, 1 minute; 150%, 3 seconds)

Drive Rating		Drive Output Current		Drive DC Input Current		SCR Bus Supply (1)	
DC Voltage	ND Power	ND Output Currents	ND Output Current Sum	ND DC Input Currents	ND DC Input Current Sum	Maximum DC Output Amps	AC Input Voltage
540V	3 x 110 kW 1 x 45 kW	3 x 205 = 615A 1 x 85 = 85A	700A	3 x 226 = 678A 1 x 95 = 95A	773A	1000A	400V
650V	3 x 60 HP 1 x 30 HP	3 x 77 = 231A 1 x 40 = 40A	271A	3 x 84.5 = 253.5A 1 x 42.9 = 42.9A	297A	400A	480V

(1) No overload capability.

Table 1.B Heavy Duty HD (150%, 1 minute; 200%, 3 seconds)

Drive Rating		Drive Output Current		Drive DC Input Current		SCR Bus Supply (1)	
DC Voltage	HD Power	HD Output Currents	HD Output Current Sum	HD DC Input Currents	HD DC Input Current Sum	Maximum DC Output Amps	AC Input Voltage
540V	3 x 90 kW	3 x 170 = 510A	510A	3 x 192.3 = 577A	577A	600A	400V

(1) No overload capability.

Fusing

The 400A and 600A PowerFlex SCR Bus Supplies have built-in AC line and DC bus fuses. The 1000A unit has six in-path fuses which simultaneously protect AC and DC paths. All units are equipped with fuse trip indicator switches. For a list of recommended replacement fuses, refer to these pages.

SCR Bus Supply	See Page...
400A	A-15
600A	A-17
1000A	A-19

Power Wiring

ATTENTION: National Codes and standards (NEC, VDE, BSI, etc.) and local codes outline provisions for safely installing electrical equipment. Installation must comply with specifications regarding wire types, conductor sizes, and disconnect devices. Failure to do so may result in personal injury and/or equipment damage.

To maintain balanced impedance, and thus balance current in the SCR Bus Supply, it is recommended to keep all wired or bus bar connections identical in size and length. This includes the AC line connection to three-phase AC line reactors and from the three-phase AC line reactors to the SCR Bus Supply.

EMC Compliance

Refer to CE Conformity on page 1-19 for details.

Cable Trays and Conduit

If cable trays or large conduits are to be used, refer to guidelines in the *Wiring and Grounding Guidelines for Pulse Width Modulated (PWM) AC Drives* (publication DRIVES-IN001).

ATTENTION: To avoid a possible shock hazard caused by induced voltages, unused wires in the conduit must be grounded at both ends. For the same reason, if a drive sharing a conduit is being serviced or installed, all drives using this conduit should be disabled. This will help minimize the possible shock hazard from "cross coupled" motor leads.

DC Bus Wiring Guidelines

For DC Bus wiring guidelines, refer to *AC Drives in Common Bus Configurations* (publication DRIVES-AT002).

Power Connection Bus Bars and Terminals

Figure 1.4 400A Unit Bus Bar and Terminal Locations for Customer Wiring

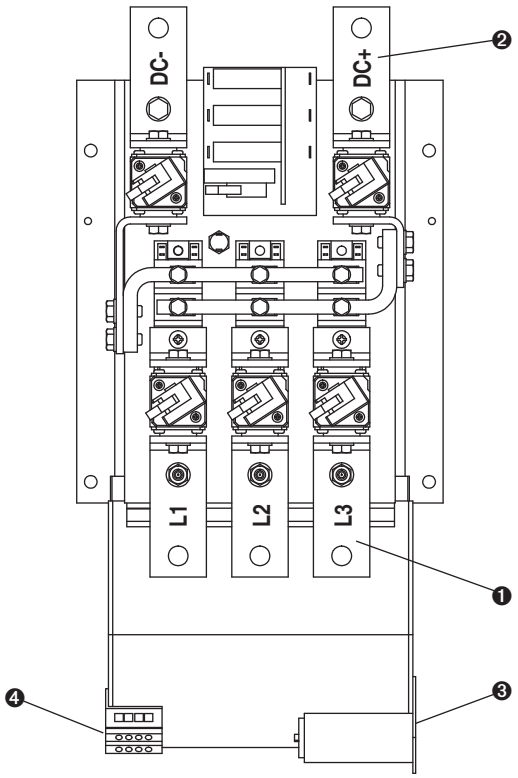


Table 1.C 400A Unit Power Connection Specifications

Item	Description	Copper Bus Bars (1)	Recommended Minimum Size	
			Bus Bar	Wire
❶	AC Line Input L1, L2, L3	40 x 5 mm (1.57 x 0.2 in.) with single 14 mm (0.55 in.) diameter hole for customer terminal	40 x 5 mm	120 mm^2 (or 2 x 50 mm^2)
❷	DC Bus DC+, DC-	40 x 5 mm (1.57 x 0.2 in.) with single 14 mm (0.55 in.) diameter hole for customer terminal	40 x 5 mm	150 mm^2 (or 2 x 70 mm^2)
❸	Protective Earth PE	M8 x 25 mm (0.98 in.) stud; torque to 6 N•m (54 lb•in)	Size per NEC or local code	
❹	Control Terminal Block	See Table 1.F		

(1) Input/output power bus bar connections require the use of either lug type connectors to terminate field-installed conductors or bus bars.

Figure 1.5 600A Unit Bus Bar and Terminal Locations for Customer Wiring

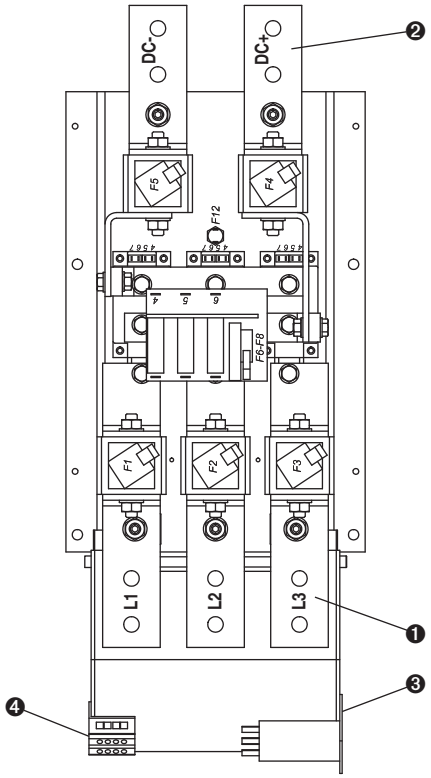


Table 1.D 600A Unit Power Connection Specifications

Item	Description	Copper Bus Bars (1)	Recommended Minimum Size	
			Bus Bar	Wire
❶	AC Line Input L1, L2, L3	50 x 5 mm (1.97 x 0.2 in.) with two 14 mm (0.55 in.) diameter holes for customer terminal	50 x 5 mm	240 mm^2 (or 2 x 95 mm^2)
❷	DC Bus DC+, DC-	50 x 5 mm (1.97 x 0.2 in.) with two 14 mm (0.55 in.) diameter holes for customer terminal	60 x 5 mm	300 mm^2 (or 2 x 120 mm^2)
❸	Protective Earth PE	M12 x 25 mm (0.98 in.) stud; torque to 15 N•m (133 lb•in)	Size per NEC or local code	
❹	Control Terminal Block	See Table 1.F		

(1) Input/output power bus bar connections require the use of either lug type connectors to terminate field-installed conductors or bus bars.

Figure 1.6 1000A Unit Bus Bar and Terminal Locations for Customer Wiring

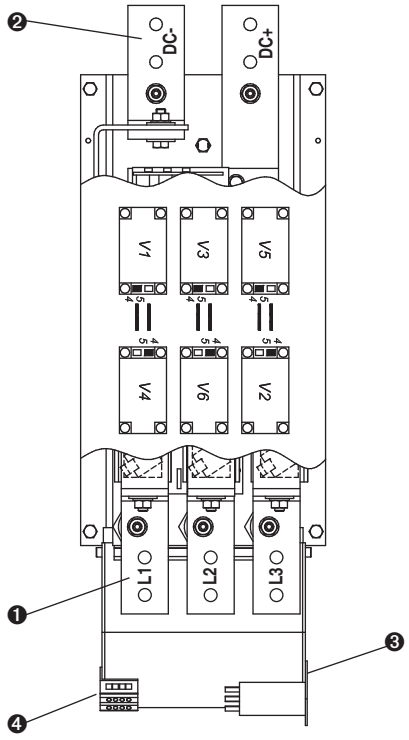


Table 1.E 1000A Unit Power Connection Specifications

Item	Description	Copper Bus Bars (1)	Recommended Minimum Size	
			Bus Bar	Wire
❶	AC Line Input L1, L2, L3	50 x 10 mm (1.97 x 0.39 in.) with two 14 mm (0.55 in.) diameter holes for customer terminal	50 x 10 mm (or 80 x 5 mm)	2 x 240 mm^2
❷	DC Bus DC+, DC-	60 x 10 mm (2.36 x 0.39 in.) with two 14 mm (0.55 in.) diameter holes for customer terminal	60 x 10 mm (or 100 x 5 mm)	2 x 300 mm^2
❸	Protective Earth PE	M12 x 25 mm (0.98 in.) stud; torque to 15 N•m (133 lb•in)	Size per NEC or local code	
❹	Control Terminal Block	See Table 1.F		

(1) Input/output power bus bar connections require the use of either lug type connectors to terminate field-installed conductors or bus bars.

Control Wiring

Important points to remember about control wiring:

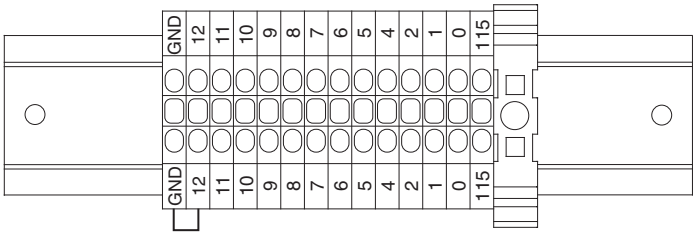
- Use Copper wire only. Wire gauge requirements and recommendations are based on 75 °C (168 °F). Do not reduce wire gauge when using higher temperature wire.
- Wire with an insulation rating of 600V or greater is recommended.
- Control wires outside the cabinet should be separated from power wires by at least 0.3 meters (1 foot).

Table 1.F Control Terminal Specifications

Item	Name	Wire Size Range[1]		Torque
		Maximum	Minimum	
❹	Control Terminals	2.5 mm^2 (14 AWG)	0.25 mm^2 (22 AWG)	0.8 N•m (7 lb•in)

(1) Maximum/minimum sizes that the terminals will accept - these are not recommendations.

Figure 1.7 Control Terminal Arrangement



Terminal	Bus Supply	Description	Notes
115 and 0	All units	115V AC Supply Input	For cooling blower (and power supply on the Gate Driver Board - on Master and Slave Units)
1 and 2	(1)	Contactor Coil 115V AC	Contactor must be energized to enable the controller
4 and 5	(1)	NC Contact Output (2)	Opens if the Enable Contactor is energized
6 and 7	400A and 600A units	NC Contact Output (2)	Opens if any of the snubber circuit fuses (F6…F8) trip
	1000A units		Opens if any of the snubber circuit fuses or DC bus feedback fuses (F7…F11) trip
8 and 9	400A and 600A units	NC Contact Output (2)	Opens if any of the line input or DC bus branch circuit fuses (F1…F5) trip
	1000A units		Opens if any of the line input branch circuit fuses (F1…F6) trip
10 and 11	All units	NC Contact Output (2)	Opens at power stack heat sink overtemperature
12 and GND	All units	Jumper MOVs to Ground	Disconnects MOVs from ground by removing this jumper. (See Disconnecting MOVs on page 1-14 for details.)

(1) Not used on Slave Units.

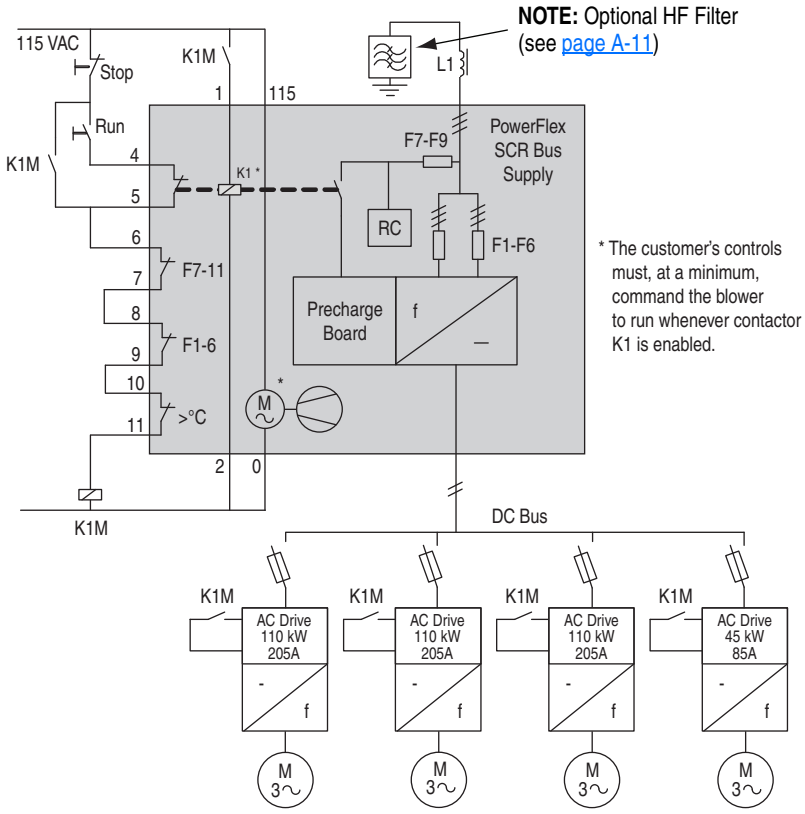
(2) Refer to Appendix A for contact rating.

Drive Run Interlock

To protect the Bus Supply from overtemperature, the normally closed contacts (Bus Supply Overtemperature - terminals 10 and 11) should be wired to either the AC line input contactor for the Bus Supply or the Run interlock circuit (enable input) of each connected drive. This ensures that the drives are stopped in case of Bus Supply Overtemperature.

Control Wiring Example

Figure 1.8 Example of SCR Bus Supply, 1000A Single with Multiple Drives Using Drive Run Interlocks, Running Simultaneous



Jumper Settings

The PowerFlex SCR Bus Supply precharge board has three jumpers. See Figure 1.9 on page 1-13 for jumper locations and positions.

- LINE TYPE Jumper: Always set to the “3-ph” default right-side position (towards the board edge).
- SPARE 1 Jumper: For board firmware version 1.21 (or earlier), this jumper is non-functional. For firmware version 1.22 (or later), the SCR Bus Supply is shipped with this jumper in the right (default) inactive state position. When the jumper is placed in the left (RGU/AFE) or active position, the firmware is active for SCR and RGU/AFE parallel operation on common bus systems, where the SCR is in parallel with an

active front end that is used only as a regenerative brake unit. The PowerFlex SCR Bus Supply will then deliver the required motoring power and the RGU/AFE will provide the possibility to feed the regenerative energy back to the AC power line. The auto-voltage limitation (allowing the SCRs to phase back) associated with high AC line will be disabled. The left (RGU/AFE) jumper position provides the best protection for parellel SCR and RGU/AFE operation.

- SPARE 2 Jumper: For board firmware version 1.21 (or earlier), this jumper is non-functional. For firmware version 1.22 (or later), this jumper is used for slow ramp-up, which slows the DC bus voltage charge up time (from 0.2 to 1.3 seconds). Slow ramp-up should be used when the connected DC bus capacitance is greater than the values shown in the following table.

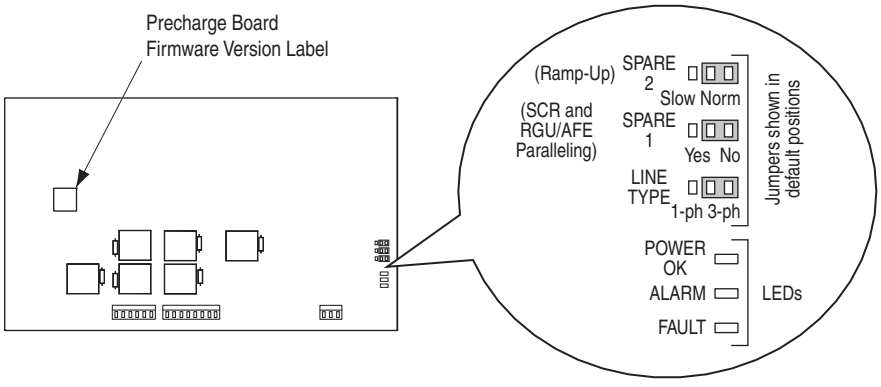
SCR Bus Supply	Max. Bus Capacitance (1) with Normal Ramp	Max. Bus Capacitance (1) with Slow Ramp
400A	40,000 µF	200,000 µF
600A	60,000 µF	300,000 µF
1000A @ 480V	100,000 µF	500,000 µF
1000A @ 690V	50,000 µF	250,000 µF

(1) It is recommended to derate the capacitance value by 20% in master/slave configurations.

To operate the SCR Bus Supply with a slow ramp-up, set the SPARE 2 jumper to the left (SLOW) position.

For standard applications where only the PowerFlex SCR Bus Supply provides the required common DC power, make sure the SPARE 1 and SPARE 2 jumpers are in their default settings (right side—towards the board edge) shown in Figure 1.9.

Figure 1.9 Location of LED Indicators and Jumpers on the Precharge Board



TIP: To identify the firmware version, remove the SCR Bus Supply cover and check the firmware version label on the Precharge Board (Figure 1.9).

Disconnecting MOVs

The PowerFlex SCR Bus Supply contains protective MOVs that are referenced to ground. To prevent damage, the MOVs should be **disconnected from ground if the Bus Supply is installed on any non-solid grounded distribution system** where the line-to-ground voltages on any phase could exceed 125% of the nominal line-to-line voltage. To disconnect the MOVs from ground, remove the jumper (12-GND) on the control terminal block shown in Figure 1.7 on page 1-11. Solid and non-solid grounded systems are defined in Table 1.G.

Table 1.G Recommended MOV Configurations

Power Source Type (1)	MOV/Input Filter Capacitors (2)	Benefits of Correct Power Source Type Configuration
Solid Grounded • AC fed, solidly grounded • DC fed from passive rectifier which has an AC source and solid ground	Connected	• UL compliance • Reduced electrical noise • Most stable operation • EMC compliance • Reduced voltage stress on components and motor bearings
Non-Solid Grounded • AC fed ungrounded • Impedance grounded • High resistive ground • B phase ground • Regenerative unit (common DC bus supply and brake) • DC fed from an active converter	Disconnected	• Helps avoid severe equipment damage when ground fault occurs

(1) It is highly recommended to accurately determine the power source type and then configure appropriately.

(2) When MOVs are disconnected, the power system must have its own transient protection to ensure known and controlled voltages.

For more information on non-solid grounded system installation, see *Wiring and Grounding Guidelines for Pulse Width Modulated (PWM) AC Drives* (publication DRIVES-UM001).

ATTENTION: To avoid an electric shock hazard, verify that the voltage on the bus capacitors has discharged before removing the jumper. Measure the DC bus voltage at the +DC and –DC output terminals. The voltage must be zero.

Table 1.H Jumper Removal

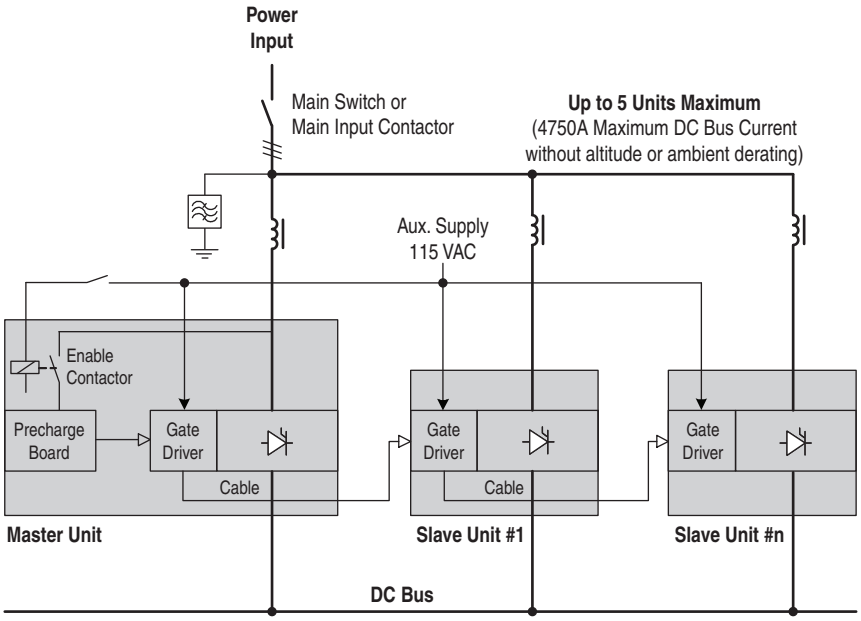
Item	Jumper	Jumper Location	Removes...
❹	12 and GND	Control Terminals (1)	MOVs from Ground

(1) For control terminal location, see Figure 1.4, Figure 1.5 or Figure 1.6.

Parallel Connection of Slave Units

Up to four 1000A PowerFlex SCR Bus Supply Slave units may be connected in parallel with one 1000A Master. The derate for each additional slave is 5% plus 5% for the master. Thus, the maximum possible output rating without altitude or ambient derating is 4750 Amps (0.95 x 5 x 1000 amps) at 40 °C.

Figure 1.10 Example for Master-Slave Configuration (shown without circuit protection for clarity)



1000A SCR Bus Supply Flexibility

The 1000A SCR Bus Supply can be converted in the following ways.

1000A SCR Bus Supply		Convert to…		
		Standalone	Master	Slave
Convert from:	Standalone		No	No
	Master	Yes		Yes
	Slave	No	No	

Because of numerous internal changes (components, cables, and hardware) the following conversions are not allowed:

- Standalone to master
- Standalone to slave
- Slave to standalone
- Slave to master

NOTE: See Figure A.11 on page A-19 for circuit board location.

Converting Master Unit to Standalone Unit

No changes are required to run a master (without slave units) as a standalone SCR Bus Supply.

Converting Master Unit to Slave Unit

It is possible to reconfigure a master SCR Bus Supply to run as a slave SCR Bus Supply. To convert a master unit to a slave, perform these steps.

1. Remove the cables between the precharge board connectors (X2 and X3) and the gate driver printed circuit board connector X4 (see Figure P.3 on page P-7).

2. Connect a cable from the gate driver printed circuit board connector (X4) to the new master SCR Bus Supply or another slave SCR Bus Supply gate connector (X6, see Figure P.4 on page P-8). Note that the precharge board does not need to be removed from the converted SCR Bus Supply.

3. Ensure that the precharge relay is not energized (terminal block…terminal 1 and 2, see page 1-11).

4. Place a label near the data nameplate stating that the SCR bus supply has been converted to catalog # 20Sx1K0NES, where x is the voltage class of the unit.

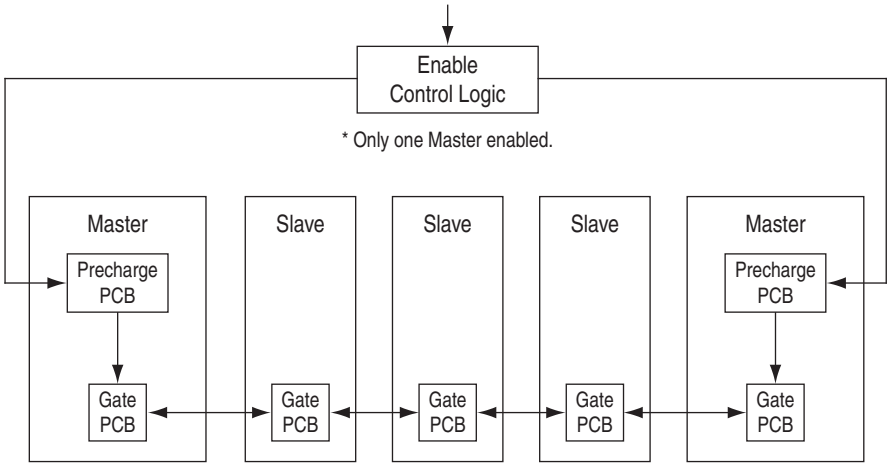
1000A SCR Bus Supply Redundancy

It is not recommended to install parallel master SCR Bus Supplies. The reason is that there is nothing to synchronize the SCR gate firing between the precharge printed circuit boards in separate SCR Bus Supplies. Each precharge board has circuitry designed to energize the DC bus, which has little to no impedance to limit the inrush current. This DC bus charging synchronization could lead to power device failure.

If redundancy of the SCR Bus Supply master is required by the application, there are two options.

- A microcontroller or other electronically or manually-controlled switch or contact network can be used to reconfigure the wire harnesses between the redundant master SCR Bus Supplies. Basically, one SCR Bus Supply becomes the master and the other becomes the slave by the logic selection of the controlling or steering network. One example of numerous possible configurations is shown in Figure 1.11.

Figure 1.11 Basic Master/Slave Redundancy System Configuration



- Although not recommended, synchronization differences might be minimized by using the slower ramp time available in precharge printed circuit boards with firmware version 1.22 (or later). The standard ramp time is for the rise of DC bus to phase full on in approximately 0.2 seconds, while the slower ramp time will take approximately 1.3 seconds. This will help to limit the inrush current in the system.

For additional recommendations about SCR Bus Supply redundancy, contact Rockwell Automation Technical Support.

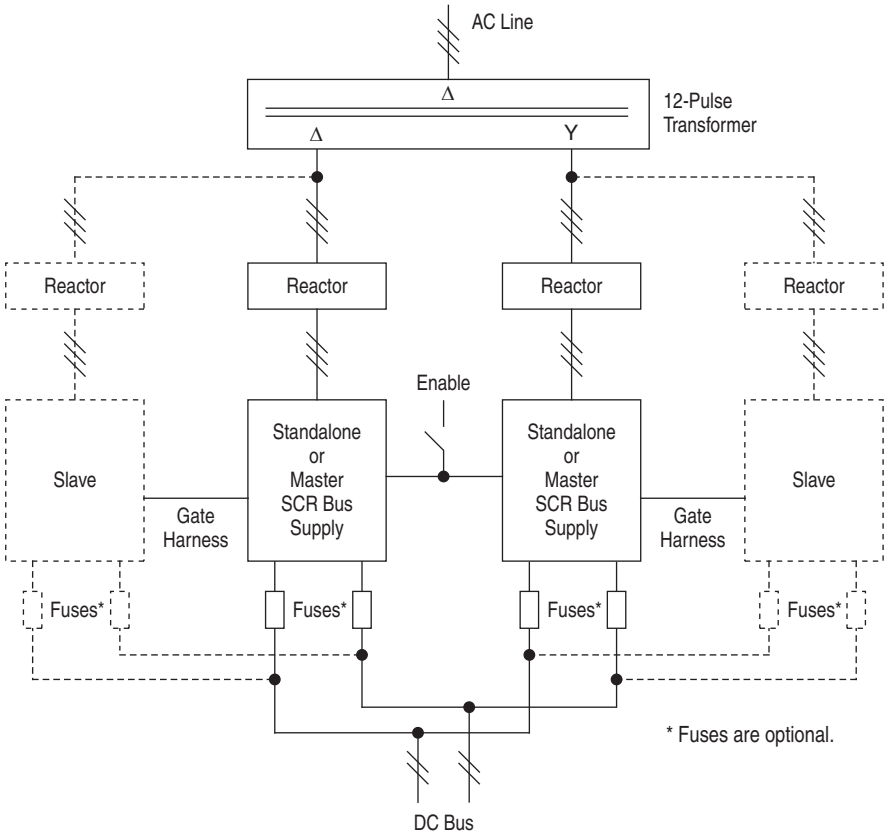
SCR Bus Supply 12-Pulse Configuration

Standalone or master/slave SCR Bus Supplies can be used on applications that use a 12-pulse transformer to minimize power line harmonics.

Important: Be sure to select the slow ramp time (see Jumper Settings on page 1-12).

Figure 1.12 shows a recommended 12-pulse system configuration with optional slave SCR Bus Supplies.

Figure 1.12 12-Pulse System Configuration



For additional recommendations about SCR Bus Supply 12-pulse configurations, contact Rockwell Automation Technical Support.

CE Conformity

Conformity with the Low Voltage (LV) Directive and Electromagnetic Compatibility (EMC) Directive has been demonstrated using harmonized European Norm (EN) standards published in the Official Journal of the European Communities. The PowerFlex SCR Bus Supply complies with the EN standards listed below when installed according to the User Manual.

CE Declarations of Conformity are available online at:
http://www.ab.com/certification/ce/docs

Low Voltage Directive (73/23/EEC)

- EN50178 Electronic equipment for use in power installations

EMC Directive (89/336/EEC)

- EN61800-3 Adjustable speed electrical power drive systems Part 3: EMC product standard including specific test methods.

Harmonic Emissions

Electronic converters such as the Bus Supply can cause conducted low frequency disturbances (harmonic emissions) to the supply network. The mandatory three-phase AC line reactors will substantially reduce harmonic currents produced by the Bus Supply. However, the magnitude of the harmonic currents and resulting harmonic voltages depends upon the network impedance at the point where the unit is connected to the network. Currently there are no mandatory harmonic emission limits related to CE compliance for equipment connected to private power networks. Upon request, Rockwell Automation can provide information regarding harmonic emissions from the SCR Bus Supply.

General Notes

- The DC bus cable to the inverter(s) should be kept as short as possible to avoid electromagnetic emission and capacitive currents. Therefore the inverter(s) should be located in the same cabinet as the Bus Supply or next to the cabinet with the Bus Supply. If the connection leads between DC bus and inverter(s) are leaving the cabinet, shielded cables must be used.
- Use of line filters in non-solid grounded systems is not recommended.
- The PowerFlex SCR Bus Supply with external Line Reactor and HF filter satisfies CE EMC emission limits for the industrial environment. If used in a residential or domestic environment it may cause radio interference. The user is required to take measures to prevent interference, in addition to the essential requirements for CE compliance listed below, if necessary.

- Conformity of the drive with CE EMC requirements does not guarantee an entire machine installation complies with CE EMC requirements. Many factors can influence total machine/installation compliance.

Essential Requirements for CE Compliance

Conditions 1…5 listed below **must be** satisfied for the PowerFlex SCR Bus Supply to meet the requirements of **EN61800-3**.

1. Bus Supply and inverter must be PowerFlex type and CE compatible.
2. Externally mounted Line Reactor and HF filter (specified in Appendix A) must be connected to the line input as shown in Figure 1.8 on page 1-12.
3. Review important precaution/attention statements throughout this document before installing the drive(s).
4. Grounding as described in General Grounding Requirements on page 1-5.
5. Control wiring and DC bus wiring leaving the cabinet must be braided, shielded cable with a coverage of 75% or better, metal conduit or equivalent attenuation.

For additional conditions, refer to the respective drive Reference Manual.

Start Up/Troubleshooting

This chapter provides the necessary information for the start up and troubleshooting of the PowerFlex SCR Bus Supply.

Topic	Page
Start-Up	2-2
Precharge Board LED Indicators	2-4
Troubleshooting	2-6

ATTENTION: Power must be applied to the SCR Bus Supply and the Inverter to perform the following start-up procedure. Some of the voltages present are at incoming line potential. To avoid electric shock hazard or damage to equipment, only qualified service personnel should perform the following procedure. Thoroughly read and understand the procedure before beginning. If an event does not occur while performing this procedure, **do not proceed**. **Remove power** including user-supplied control voltages. User-supplied voltages may exist even when main AC power is not applied to the Bus Supply. Correct the malfunction before continuing.

ATTENTION: When operating the SCR Bus Supply, a minimum of one 7.5 kW (10 HP) PowerFlex 700/700S Inverter must be connected to the DC bus—otherwise the internal fault detection circuit will interpret the condition as an *Output Voltage Loss* and stop pulse firing. This is indicated on the Precharge Board by the Alarm LED (7 flashes) and after 30 seconds by the Fault LED (2 flashes). Refer to Table 2.A and Table 2.B.

ATTENTION: Second source of power for cooling blower is present. To avoid an electric shock hazard or moving blades, verify the AC power supply has been removed prior to performing any maintenance or repairs.

Start-Up

Before Applying Power to the Bus Supply

❑ **1.** Verify that the minimum of one Inverter is connected to the DC bus.

❑ **2.** Confirm that all inputs are connected to the correct terminals and are properly torqued.

❑ **3.** Using an ohmmeter or other continuity testing device, verify that shorts do not exist between Source 1 and Source 2:

Source 1	Source 2	Checkmark Below if No Short Exists
L1	L2	
L1	L3	
L2	L3	
L1	PE	
L2	PE	
L3	PE	
L1	DC+ Bus	
L2	DC+ Bus	
L3	DC+ Bus	
L1	DC- Bus	
L2	DC- Bus	
L3	DC- Bus	
DC+ Bus	DC- Bus	
DC+ Bus	PE	
DC Bus	PE	

❑ **4.** Verify that AC line power at the disconnect device is within the rated value of the Bus Supply. See Appendix A.

❑ **5.** Verify that control power voltage is correct.

❑ **6.** Verify that the enable contactor coil K1 (not used on *Slave* units) is correctly wired.

❑ **7.** Verify that these four outputs are correctly wired:

- Bus Supply Overtemperature
- Rectifier Fuse Trip
- Snubber/DC feedback Fuse Trip
- Enable Contactor Feedback (not used on Slave units)

These normally closed contact outputs are used to set alarms and to stop the drive(s). Verify that they have been wired correctly according to the user's specification. Refer to the control wiring example shown in Figure 1.8 on page 1-12.

❑ **8.** Verify that the "Line Type" jumper on the Precharge Board shown in Figure 2.1 is set to the "3-ph" position (default).

❑ **9.** Verify that the SPARE 1 and SPARE 2 jumpers on the Precharge Board shown in Figure 2.1 are set to appropriate positions for the application. (Refer to Jumper Settings on page 1-12 and Figure 1.9 on page 1-13 for more information).

❑ **10.** Verify that the jumper between control terminals 12 and GND (Figure 1.7 on page 1-11) is present on grounded supply lines (default) or is removed on non-solid grounded supply lines. (Refer to Disconnecting MOVs on page 1-14 for more information).

Applying AC Power to the Bus Supply

❑ **1.** Apply AC power and control voltage (115V AC) to the Bus Supply.

The green POWER OK LED on the Precharge Board should be on if power is applied to terminals L1 (R), L2 (S), L3 (T) and the enable contactor for the precharge board (not used on Slave units) is energized.

❑ **2.** If the green POWER OK LED is off at this point, refer to Table 2.B.

Precharge Board LED Indicators

The three LEDs on the Precharge Board are visible through a small slot in the SCR Bus Supply cover. The 400A unit cover has one slot. The 600A unit cover has two slots but only the lower slot is used to view the LEDs. Since the Precharge Board for the 1000A unit is mounted either on the lower carrier plate (on Single Units) or on the upper carrier plate (on Master Units), the corresponding lower or upper slot is used to view the LEDs. For slot locations, see Figure A.1 on page A-3.

ATTENTION: The SCR Bus Supply LEDs are only operational when the unit is energized. Servicing energized equipment can be hazardous. Severe injury or death can result from electrical shock, burn, or unintended actuation of the controlled equipment. Follow safety-related practices of NFPA 70E, Electrical Safety For Employee Workplaces. DO NOT work alone on energized equipment!

Figure 2.1 Location of LED Indicators and Jumpers on the Precharge Board

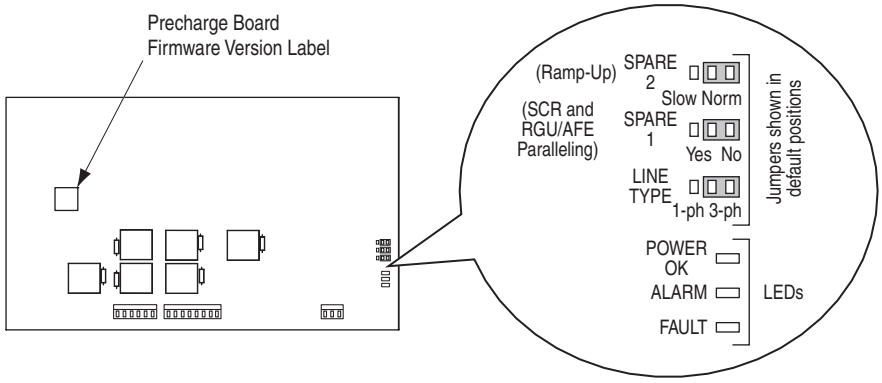


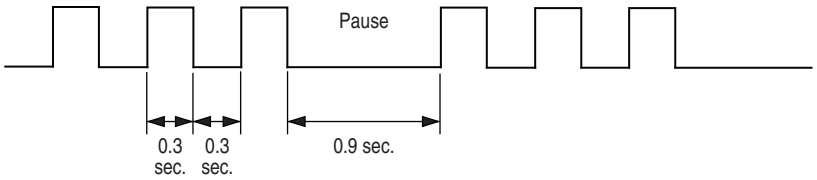
Table 2.A Precharge Board LED Indicators

Name	Color	State	Description
POWER OK	Green	Steady	Illuminates when precharge board power supply is operational.
ALARM	Yellow	Flashing	The **number [n] of flashes** (see flashing pattern in Figure 2.2) indicates one of the following alarms (1):
		[1]	Low Line Voltage (< 90%) Low Line Voltage (< 65%) for SCR and RGU/AFE paralleling mode
		[2]	Very Low Line Voltage (< 50%)
		[3]	Low Phase (One phase < 80% of line voltage), or Low Phase Voltage (One phase < 56% of line voltage) for SCR and RGU/AFE paralleling mode
		[4]	Freq. out of range or asymmetry (Line synchronization failed)
		[5]	Low DC Bus Voltage (triggers ride-through operation)
		[6]	Input Frequency momentarily out of range (40…65 Hz)
		[7]	DC Bus Short Circuit testing active (repetitive for appr. 120 s) or no inverter connected to the bus
FAULT	Red	Flashing	The **number [n] of flashes** (see flashing pattern in Figure 2.2) indicates one of the following faults (2):
		[2]	DC Bus Short (Udc < 2% after 20ms)
		[4]	Line Synchronization failed or Low Line (Uac < 50% Unom)
		[5]	Jumper setting wrong

(1) The ALARM indicator LED will continue the flashing pattern as long as the alarm condition exists. An alarm might trigger internal actions which may stop SCR gate firing.

(2) If a fault occurs, the FAULT indicator LED will continue the flashing pattern, even if the fault condition no longer exists. Power must be cycled to clear the fault.

Figure 2.2 Flashing Pattern for ALARM and FAULT LEDs



Example: Flashing pattern for ALARM LED showing a Low Phase alarm (where n = 3 flashes)

Troubleshooting

Table 2.B Possible Faults and Corrective Actions

Fault	Cause	Corrective Action
Heat sink Overtemperature	Heat sink temperature exceeds maximum rating	1. Verify that maximum ambient temperature has not been exceeded. 2. Check Overtemperature Switch (N.C. contacts) at control terminals 10 and 11. 3. Check 115V AC supply input voltage at control terminals 0 and 115. 4. Check blower for correct operation. 5. Check for excess load on the bus supply. 6. Check for minimum mounting clearance around the bus supply. 7. Contact your local RA sales office.
DC Output Voltage Loss	DC bus: - Short Circuit FAULT [2] or - Low Line FAULT [4] or - No Load ALARM [7] Refer to Table 2.A.	1. Check 3-phase AC incoming power for undervoltage or phase loss. 2. Check all Bus Supply fuse trip indicator switches. 3. Verify the Inverter is connected. 4. Verify the power of the connected Inverter(s) is minimum 7.5 kW (10 HP). Refer to the 2nd Attention statement on page 2-1. 5. Contact your local RA sales office.
	Loss of 115V AC power	1. Check 115V AC supply input voltage at control terminals 0 and 115. 2. Check Enable Contactor function. 3. Contact your local RA sales office.
Jumper setting wrong	Wrong jumper settings: Single phase (1-ph) line type and one or both of the SPARE 1 or SPARE 2 jumpers set to their respective left positions.	1. Check the jumper setting(s). 2. Set the jumper(s) correctly.

Important: Complete the tests listed in Table 2.C without power applied to the SCR Bus Supply.

Table 2.C Control Terminal Block Continuity Test Conditions

Test Condition	Possible Cause	Corrective Action
N.C. contact on control terminals 6 and 7 is open	400A and 600A Unit: Open snubber fuse (F6…F8). 1000A Unit: Open snubber fuse or open DC bus fuse (F7…F11).	1. Check for evidence of power module failure (see Step 3 in Start-Up on page 2-2). 2. Check for evidence of failure in snubber circuit. Check the snubber pcb diodes and snubber resistor and capacitor. 3. Replace entire SCR Bus Supply if any device has failed. 4. If there is no evidence of a failure, check for open fuse and replace.
N.C. contact on control terminals 8 and 9 is open	400A and 600A Unit: Open AC line fuse or open DC bus fuse (F1…F5). 1000A Unit: Open AC line fuse (F1…F6).	1. Check for evidence of power module failure (see Step 3 in Start-Up on page 2-2). 2. Replace entire SCR Bus Supply if any device has failed. 3. If there is no evidence of power module failure, check for open fuse and replace.
N.C. contact on control terminals 10 and 11 is open	Open heat sink Overtemperature Switch	1. Verify that maximum ambient temperature is not exceeded. 2. Replace the Overtemperature Switch.

Notes:

Specifications

This appendix provides electrical, environmental, functional and physical specifications for the PowerFlex SCR Bus Supply, and selection tables for AC input devices.

Topic	Page
PowerFlex SCR Bus Supply	A-1
Bus Supply Dimensions	A-3
Accessories	A-7
Spare Parts	A-14

PowerFlex SCR Bus Supply

Specifications Dependent on Power and Voltage

Category	Specification	SCR Bus Supply Catalog Number			
		20SD400...	20SD600...	20SD1K0...	20SF1K0...
Input Ratings	Nominal AC Input Voltage:	400/480V			600/690V
	Frequency:	47…63 Hz			47…63 Hz
	Operational AC Input Voltage Range:	187…528V			528…759V
	Input Current (Max. Continuous rms):	355	521	843	843
	Input kVA at Max. Continuous rms Amps:	246/295	361/433	584/700	876/1007
Output Ratings	DC Bus Amps	Normal Duty/Heavy Duty			
	Continuous: 1 minute: 3 Sec. every minute:	300/240 330/360 450/480	500/400 550/600 750/800	800/720 880/1080 1200/1440	800/720 880/1080 1200/1440
	Max. Continuous DC Bus Amps **without** Overload:	400	600	1000	1000
	Power Dissipation [1] — Watts at Maximum Continuous Amps:	1200	1600	2700	2800

[1] Includes appropriate AC line reactor.

The derate for each additional slave is 5% plus 5% for the master. See Parallel Connection of Slave Units on page 1-15.

Specifications Dependent on Voltage

AC Input Voltage	DC Bus Voltage	
	Nominal	Maximum
400V	540V	750V
480V	650V	750V
600V	810V	1080V
690V	930V	1080V

Specifications Common to All SCR Bus Supplies

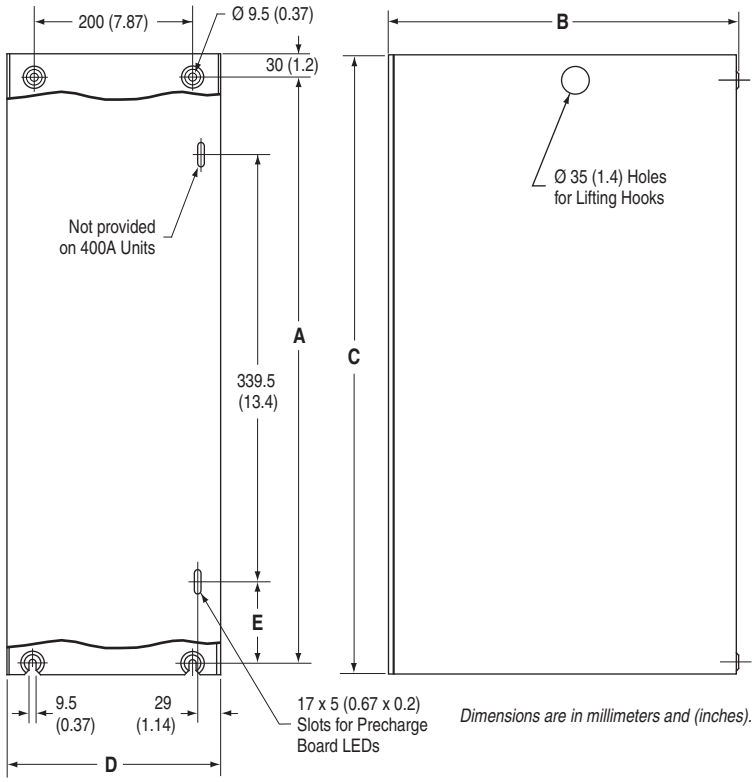
Category	Specification	
Input/Output Ratings	Voltage Tolerance:	–10% of minimum, +10% of maximum
	Frequency Tolerance:	47…63 Hz.
	Displacement Power Factor:	0.92 lagging (entire load range)
	Efficiency:	99.5% at rated amps, nominal line volts
	Line Transients:	Up to 6000 volts peak per IEEE C62.41-1991
	Max. Short Circuit Current Rating:	85 kA
	Cooling	Forced ventilation cooled by tangential blower below heat sink
	Blower Power Consumption: Cooling Air:	200 VA 600 m^3/hr.
Control Input	Enable Contactor Coil:	Single Phase 115V AC, 30 VA (pick-up), 4.5 VA (hold)
	Blower Current Consumption:	Single Phase 115V AC, 50/60 Hz, 1 A
Control Output	Heat Sink Temperature Sensor:	The temperature sensor trips if heat sink temperature exceeds maximum temperature.
	NC Contact Output Rating (Max.):	Resistive Rating: 15A at 125V AC, 10A at 250V AC, 7A at 24V DC Inductive Rating: 10A at 125V AC, 6A at 250V AC
	Fuse Trip Indication Microswitches F1…F5 (400A & 600A) Microswitches F1…F6 (1000A) NC Contact Output Rating (Max.):	Resistive Rating: 10A at 30…250V AC, 8A at 30V DC Inductive Rating: L/R = 25 ms, 10A at 30…250V AC
	Fuse Trip Indication Microswitches F6…F8 (400A & 600A) Microswitches F7…F11 (1000A) NC Contact Output Rating (Max.):	Resistive Rating: 10A at 30…250V AC, 8A at 30V DC Inductive Rating: L/R = 25 ms, 10A at 30…250V AC
	Enable Contactor K1, NC Contact Output Rating (Max.):	Resistive Rating: 10A at 24…230V AC, 3A at 30V DC Inductive Rating: 2.2A at 24…230V AC
Approvals and Standards Compliance	NFPA 70 - US National Electrical Code NEMA ICS 3.1 - Safety standards for Construction and Guide for Selection, Installation and Operation of Adjustable Speed Drive Systems. NEMA 250 - Enclosures for Electrical Equipment IEC 146 - International Electrical Code.	
	c UL us	UL and cUL Listed to UL508C and CAN/CSA-C22.2
	CE	Marked for all applicable European Directives: • EMC Directive (89/336/EEC) • Emissions: EN 61800-3 Adjustable Speed electrical power drive systems Part 3 • Immunity: EN 61800-3 Second Environment, Restricted Distribution • Low Voltage Directive (73/23/EEC) • EN 50178 Electronic Equipment for Use in Power Installations
Environment	Altitude:	1000 m (3300 ft.) max. without derating. Above 1000 m, the derating for the output current is 1% per 100 m (330 ft.).
	Ambient Operating Temperature without Derating - Open Type / IP00:	0…40 °C (32…104 °F); above 40 °C up to 50 °C (122 °F) maximum temperature, the output Amps must be derated by: 1.2% per °C (2.2% per °F) for 400A unit 1.0% per °C (1.8% per °F) for 600A unit 1.0% per °C (1.8% per °F) for 1000A unit
	Storage Temperature (all const.):	–40…70 °C (–40…158 °F)
	Relative Humidity:	5…95% non-condensing

Category	Specification	
Environment *(continued)*	Shock:	15G peak for 11 ms duration (± 1.0 ms)
	Vibration:	0.152 mm (0.006 in.) displacement, 1G peak
	Atmosphere:	**Important:** The bus supply **must not** be installed in an area where the ambient atmosphere contains volatile or corrosive gas, vapors or dust. If the bus supply is not going to be installed for a period of time, it must be stored in an area where it will not be exposed to a corrosive atmosphere.
	Surrounding Environment:	The fan has a L10 rated life of 74,000 hours in a clean environment. Execessive dust and heat will degrade fan life.
Permitted Maximum Capacitance	Maximum Capacitance for Connection to the DC Bus Supply	This is the total DC Bus capacitance sum of the permitted drives to connect. See Minimum Capacitance on page 1-6 and Jumper Settings on page 1-12.

Bus Supply Dimensions

The overall dimensions and mounting holes of the PowerFlex SCR Bus Supply are shown in Figure A.1. Connection Bus Bar dimensions are shown in Figure A.2, Figure A.3, and Figure A.4.

Figure A.1 Bus Supply Mounting Dimensions



SCR Bus Supply	Dimensions					Weight
	A	B	C	D	E	
400A	535 (21.1)	404 (15.9)	580 (22.8)	276 (10.9)	138.5 (5.5)	30 kg (66 lb.)
600A	740 (29.1)	490 (19.3)	785 (30.9)	276 (10.9)	104.5 (4.1)	43 kg (95 lb.)
1000A	740 (29.1)	490 (19.3)	785 (30.9)	276 (10.9)	104.5 (4.1)	67 kg (147 lb.)

Figure A.2 400A Unit Bus Bar Customer Connection Point Dimensions/Locations

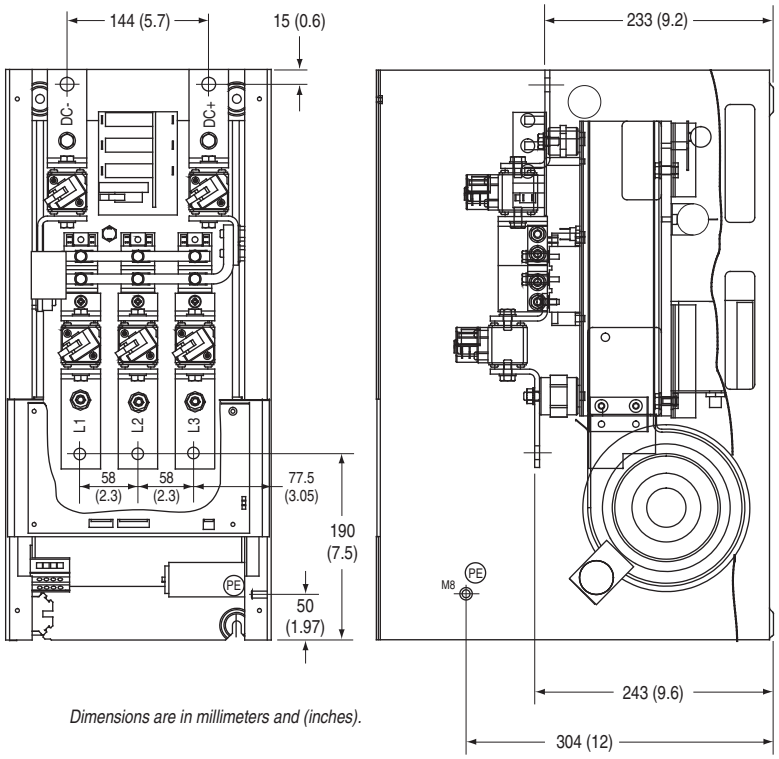


Figure A.3 600A Unit Bus Bar Customer Connection Point Dimensions/Locations

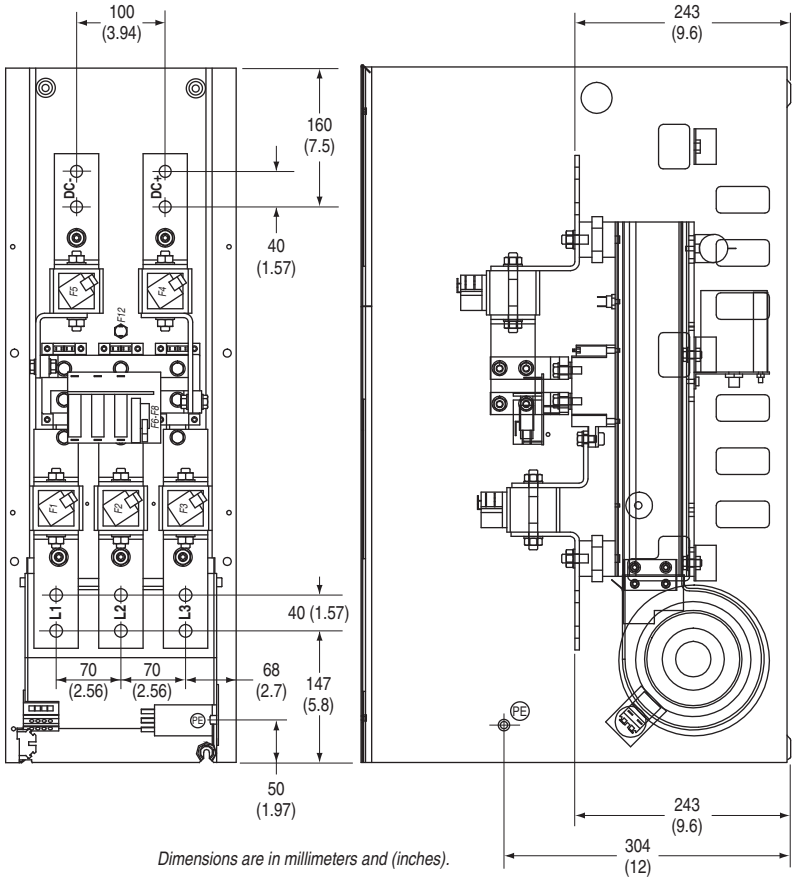
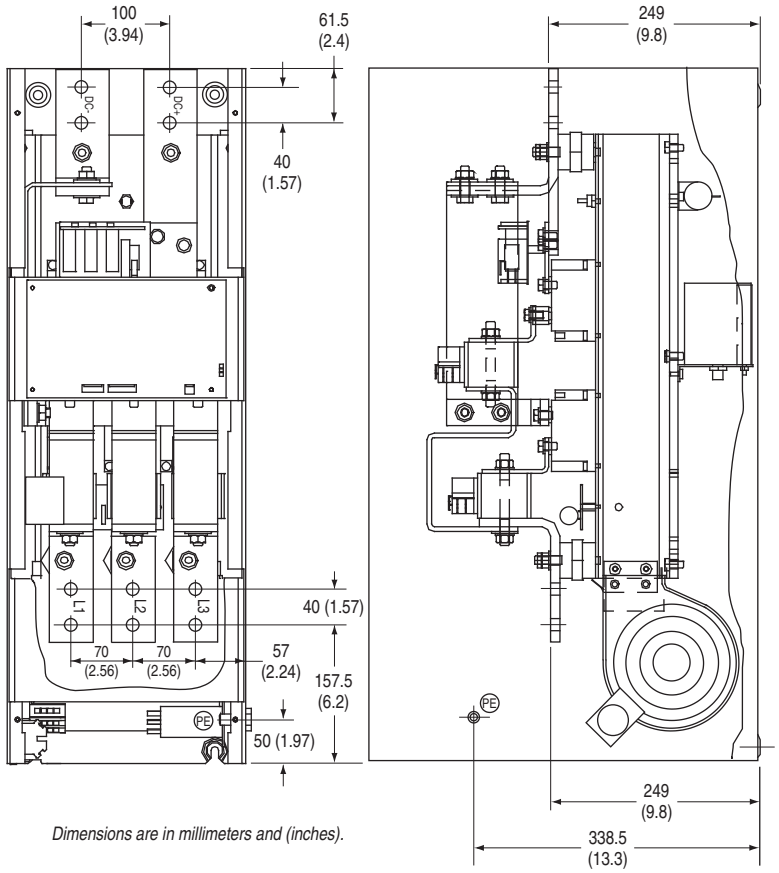


Figure A.4 1000A Unit Bus Bar Customer Connection Point Dimensions/Locations



Accessories

Line Reactors

A minimum reactance is required to limit peak currents in the AC line and the bridge circuit. This can be accomplished either by a matched supply transformer or by adding line reactors to ensure the requested minimum voltage drop over the total line impedance. The preferred method is to install a minimum 3% line reactor, which will also reduce line harmonics.

Use Table A.A through Table A.D to select a line reactor based on the sum of the drive's connected DC Amps and the supply transformer rating.

For more details on the 1321-Series line reactors, see the *1321 Power Conditioning Products Technical Data* (publication 1321-TD001).

Table A.A 400V, 50Hz Line Reactor Selection

Drives	Ranges of Drives DC Amp Sum for Typical Supply Transformers (1)							Line Reactor	
Sum of DC Amps	630 kVA 5% 43 µH	800 kVA 5% 35 µH	1000 kVA 5.5% 31 µH	1250 kVA 6% 27 µH	1600 kVA 6% 22 µH	2500 kVA 6.5% 16 µH	3000 kVA 6.5% 13 µH	Induct. [µH]	Catalog No. 1321-... (2)
up to 203	120-150	120-154	120-160	120-165	120-168	120-173	120-176	230	3R160-C
	151-203	155-203	161-203	166-203	169-203	174-203	177-203	150	3R160-B
								75	3R160-A
204 to 255	—	—	—	204-206	204-209	204-219	204-224	185	3R200-C
	204-255	204-255	204-255	207-255	210-255	220-255	225-255	110	3R200-B
								55	3R200-A
256 to 319	—	—	—	—	—	256-260	256-275	150	3RB250-C
	256-319	256-319	256-319	256-319	256-319	261-319	276-319	90	3RB250-B
								45	3RB250-A
320 to 407								125	3RB320-C
	320-335	320-370	320-390	320-407	320-407	320-407	320-407	75	3RB320-B
	336-407	371-407	391-407	—	—	—	—	40	3RB320-A
408 to 509								105	3RB400-C
	—	408-425	408-450	408-480	408-509	408-509	408-509	60	3RB400-B
	408-509	426-509	451-509	481-509	—	—	—	30	3RB400-A
510 to 635	—	—	—	510-538	510-590	510-635	510-635	50	3R500-B
	510-540	510-580	510-635	539-635	591-635	—	—	25	3R500-A
636 to 763	—	—	—	—	636-660	636-763	636-763	40	3R600-B
	—	636-763	636-763	636-763	661-763	—	—	20	3R600-A
764 to 938	—	—	—	—	—	764-900	764-938	29	3R750-B
	—	764-800	764-870	764-900	764-938	901-938	—	15	3R750-A
939 to 1K0	—	—	—	—	—	939-1K0	939-1K0	27	3R850-B
	—	—	—	—	939-1K0	—	—	15	3R850-A

(1) The inductance value of the supply transformers includes 2.5 µH for 10 m feeder cable.

(2) The number in the catalog string represents the fundamental AC current rating of the reactor.

Table A.B 480V, 60Hz Line Reactor Selection

Drives	Ranges of Drives DC Amp Sum for Typical Supply Transformers (1)							Line Reactor	
Sum of DC Amps	630 kVA 5% 51 µH	800 kVA 5% 41 µH	1000 kVA 5.5% 36 µH	1250 kVA 6% 32 µH	1600 kVA 6% 26 µH	2500 kVA 6.5% 19 µH	3000 kVA 6.5% 16 µH	Induct. [µH]	Catalog No. 1321-... (2)
up to 203	120-140	120-144	120-150	120-155	120-160	120-165	120-170	230	3R160-C
	141-203	145-203	151-203	156-203	161-203	166-203	171-203	150	3R160-B
204 to 255	—	—	—	—	204-209	204-214	204-218	185	3R200-C
	204-255	204-255	204-255	204-255	210-255	215-255	219-255	110	3R200-B
								55	3R200-A
256 to 319	—	—	—	—	—	—	256-260	150	3RB250-C
	256-290	256-319	256-319	256-319	256-319	256-319	261-319	90	3RB250-B
	291-319	—	—	—	—	—	—	45	3RB250-A
320 to 407	—	320-340	320-360	320-380	320-407	320-407	320-407	75	3RB320-B
	320-407	341-407	361-407	381-407	—	—	—	40	3RB320-A
408 to 509	—	—	408-420	408-450	408-490	408-509	408-509	60	3RB400-B
	408-440	408-509	421-509	451-509	491-509	—	—	30	3RB400-A
510 to 635	—	—	—	—	510-540	510-620	510-635	50	3R500-B
	510-560	510-585	510-600	510-635	541-635	621-635	—	25	3R500-A
636 to 763	—	—	—	—	—	636-700	636-763	40	3R600-B
	—	636-680	636-763	636-763	636-763	701-763	—	20	3R600-A
764 to 938	—	—	—	—	—	764-840	764-938	29	3R750-B
	—	—	—	764-938	764-938	841-938	—	15	3R750-A
939 to 1K0	—	—	—	—	—	939-1K0	939-1K0	27	3R850-B
	—	—	—	—	939-1K0	—	—	15	3R850-A

(1) The inductance value of the supply transformers includes 2.5 µH for 10 m feeder cable.

(2) The number in the catalog string represents the fundamental AC current rating of the reactor.

Table A.C 600V, 60Hz Line Reactor Selection

Drives	Ranges of Drives DC Amp Sum for Typical Supply Transformers (1)							Line Reactor	
Sum of DC Amps	630 kVA 5% 78 µH	800 kVA 5% 62 µH	1000 kVA 5.5% 55 µH	1250 kVA 6% 48 µH	1600 kVA 6% 38 µH	2500 kVA 6.5% 27 µH	3000 kVA 6.5% 21 µH	Induct. [µH]	Catalog No. 1321-... (2)
up to 203	120-155	120-164	120-175	130-180	130-190	130-199	140-203	230	3R160-C
	156-203	165-203	176-203	181-203	191-203	200-203	—	150	3R160-B
								75	3R160-A
204 to 255	—	—	204-209	204-230	204-230	204-255	204-255	185	3R200-C
	204-255	204-255	210-255	231-255	231-255	—	—	110	3R200-B
								55	3R200-A
256 to 319	—	—	—	—	256-270	256-295	256-319	150	3RB250-C
	256-280	256-319	256-319	256-319	271-319	296-319	—	90	3RB250-B
	281-319	—	—	—	—	—	—	45	3RB250-A
320 to 407	—	320-340	320-360	320-390	320-407	320-407	320-407	75	3RB320-B
	320-407	341-407	361-407	391-407	—	—	—	40	3RB320-A
408 to 509	—	—	—	—	—	—	408-425	105	3RB400-C
	—	—	—	408-440	408-509	408-509	426-509	60	3RB400-B
	408-450	408-509	408-509	441-509	—	—	—	30	3RB400-A
510 to 635	—	—	—	—	510-545	510-635	510-635	50	3R500-B
	—	510-560	510-600	510-635	546-635	—	—	25	3R500-A
636 to 763	—	—	—	—	—	636-740	636-763	40	3R600-B
	—	—	—	636-750	636-763	741-763	—	20	3R600-A
764 to 938	—	—	—	—	—	764-840	764-938	29	3R750-B
	—	—	—	—	764-938	841-938	—	15	3R750-A
939 to 1K0	—	—	—	—	—	939-1K0	939-1K0	27	3R850-B
	—	—	—	—	939-1K0	—	—	15	3R850-A

(1) The inductance value of the supply transformer includes 2.5 µH for 10 m feeder cable.

(2) The number in the catalog string represents the fundamental AC current rating of the reactor.

Table A.D 690V, 50Hz Line Reactor Selection

Drives	Ranges of Drives DC Amp Sum for Typical Supply Transformers (1)							Line Reactor	
Sum of DC Amps	630 kVA 5% 123 µH	800 kVA 5% 95 µH	1000 kVA 5.5% 86 µH	1250 kVA 6% 75 µH	1600 kVA 6% 59 µH	2500 kVA 6.5% 42 µH	3000 kVA 6.5% 33 µH	Induct. [µH]	Catalog No. 1321-... (2)
up to 203	—	130-150	130-157	130-162	130-170	140-180	150-185	2x150	3R160-B (3)
	130-175	151-190	158-203	163-203	171--203	181-203	186-203	230	3R160-C
	176-203	191-203	—	—	—	—	—	150	3R160-B
								75	3R160-A
204 to 255	—	—	—	—	—	204-210	204-220	2x110	3R200-B (3)
	204-206	204-230	204-245	204-255	204-255	211-255	221-255	185	3R200-C
	207-255	231-255	246-255	—	—	—	—	110	3R200-B
								55	3R200-A
256 to 319	—	—	—	—	—	—	256-260	2x90	3RB250-B (3)
	—	256-260	256-270	256-290	256-319	256-319	261-319	150	3RB250-C
	256-280	261-319	271-319	291-319	—	—	—	90	3RB250-B
	281-319	—	—	—	—	—	—	45	3RB250-A
320 to 407	—	—	—	—	320-360	320-407	320-407	125	3RB320-C
	—	320-360	320-380	320-407	361-407	—	—	75	3RB320-B
	320-407	361-407	381-407	—	—	—	—	40	3RB320-A
408 to 509	—	—	—	—	—	408-465	408-509	105	3RB400-C
	—	—	408-414	408-450	408-509	466-509	—	60	3RB400-B
	—	408-500	415-509	451-509	—	—	—	30	3RB400-A
510 to 635	—	—	—	—	—	510-520	510-580	85	3R500-C
	—	—	—	510-538	510-570	521-635	581-635	50	3R500-B
	—	—	510-540	539-635	571-635	—	—	25	3R500-A
636 to 763	—	—	—	—	—	—	636-650	65	3R600-C
	—	—	—	—	—	636-763	651-763	40	3R600-B
	—	—	—	—	661-763	—	—	20	3R600-A
764 to 938	—	—	—	—	—	—	764-780	48	3R750-C
	—	—	—	—	—	764-850	781-938	29	3R750-B
	—	—	—	—	—	851-938	—	15	3R750-A
939 to 1K0	—	—	—	—	—	—	—	42	3R850-C
	—	—	—	—	—	939-1K0	939-1K0	27	3R850-B
	—	—	—	—	—	—	—	15	3R850-A

(1) The inductance value of the supply transformers includes 2.5 µH for 10 m feeder cable.

(2) The number in the catalog string represents the fundamental AC current of the reactor.

(3) Connect two reactors in series.

HF Filter

It is recommended to install one HF filter (Catalog No. 20S-RFC) in every system. When this filter is used, the HF emission limits for class A, group 2* (EN 55011) in the 2nd environment (industrial supply network) according to the product standard EN 61800-3 are met and the Bus Supply fulfills CE conformity.

The HF filter is connected in front of the AC line reactor between the three AC line input phases and the protection earth conductor PE (Figure A.5).

Figure A.5 HF Filter Wiring Diagram

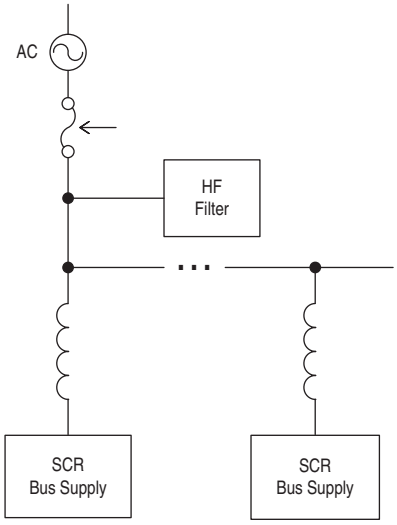
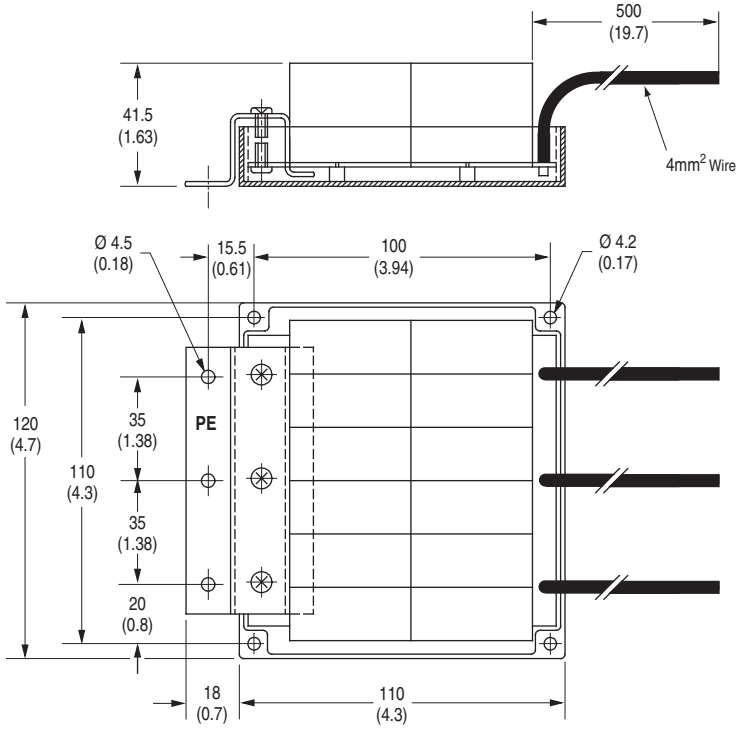


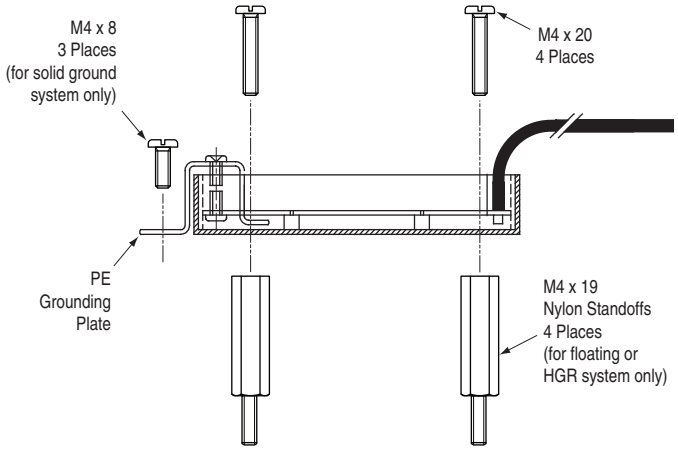
Figure A.6 20S-RFC Filter Dimensions



Solid Ground Systems

Using the hole location dimensions from Figure A.6, install the HF filter using the four (4) M4 x 20 screws through the four holes in the plastic body of the HF filter (Figure A.7). Then install the three (3) M4 x 8 screws through the PE grounding plate. Do NOT use the nylon standoffs.

Figure A.7 Mounting the HF Filter



Non-Solid Ground Systems

The HF filter may be installed with floating or HRG ground systems for line-to-line transient protection. In this type of installation, the PE grounding plate should NOT be connected to ground, but remain isolated from ground.

Important: The HF filter PE grounding plate will be floating with potential high voltage with respect to earth ground when AC line power is applied.

Using the hole location dimensions from Figure A.6, install the HF filter using the four (4) M4 x 19 nylon standoffs and four (4) M4 x 20 screws through the four holes in the plastic body of the HF filter (Figure A.7). Finger tighten the nylon standoffs. Do NOT install the three (3) M4 x 8 screws through the PE grounding plate.

Install the High Voltage Warning label onto the PE grounding plate when the HF filter is installed with a floating or HRG ground system.

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Spare Parts

400A SCR Bus Supply

Important: SCR Bus Supplies are NOT designed to be field repaired, but can be field maintained.

Figure A.8 400A Unit Spare Part Locations

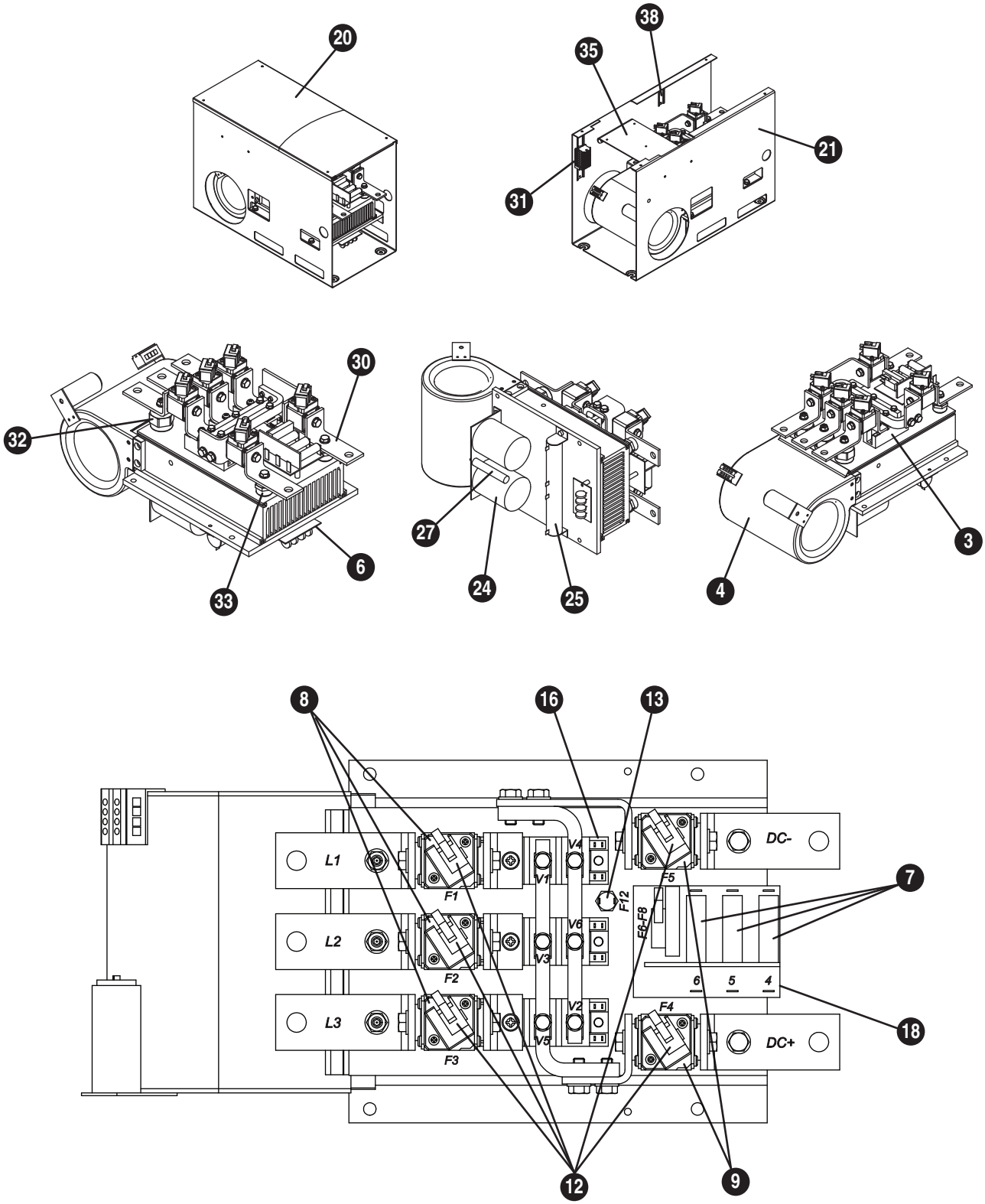


Table A.E 400A Unit Spare Part Numbers/Descriptions

Item	Availability [1]	Description	Rockwell Catalog No.	Qty.
3	—	400A SCR Set	SK-20S-MCC162-18IO1	3
4	Yes	Fan Assembly [2]	SK-D9-FAN2	1
6	—	400A and 600A MOV Assembly	SK-20S-VBKSDK041	1
7	Yes	40A Fuse (Precharge fuses F6…F8) [3]	SK-20S-F070B040S or Westcode Type F070B040S or Ferraz Shawmut Type 6.921CPgRC14.51 40	3
8	Yes	400A, 700V Fuse (AC fuses F1…F3) Torque to 13 N•m (115 lb•in).	SK-20S-069UR0S0400B or Westcode Type 069UR0S0400B or Ferraz Shawmut Type 6.9URD30TTF0400	3
9	Yes	450A, 700V Fuse (DC fuses F4 and F5) Torque to 13 N•m (115 lb•in).	SK-20S-069UR0S0450B or Westcode Type 069UR0S0450B or Ferraz Shawmut Type 6.9URD30TTF0450	2
12	Yes	Fuse Monitoring Switch	SK-20S-MS3V1-5	5
13	—	85 °C Thermostat	SK-20S-SWT85KSDKRW	1
16	—	400A SCR Wire Harness	SK-20S-ZY041-400	1
18	Yes	400 and 600A Snubber Circuit Board	SK-20S-PR-GR3	1
20	—	400A Cover	SK-20S-RW9582300-B	1
21	—	400A Enclosure	SK-20S-RW-U-SCR400	1
24	—	10 µF, 1200V Capacitor	SK-20S-E62K85103D1W	2
25	—	5.6K Ohm, 90W Resistor	SK-20S-RW35FST5K6K	2
27	—	4.7 Ohm, 45W Resistor	SK-20S-RW33FST4R7K	1
30	—	400A Bus Bar Set	SK-20S-BBKSDK041	1
31	—	Terminal Block Assembly	SK-20S-TBKSDKRW	1
32	—	40 mm tall x 40 mm O.D. Insulator with M10 Thread	SK-20S-IN551520	3
33	—	30 mm tall x 26 mm O.D. Insulator with M8 Thread	SK-20S-IN551450	2
35	Yes	480V SCR Precharge Circuit Board [4]	SK-D9-SCRPRE1-D	1
38	Yes	Precharge Relay	SK-20S-CA2KN31F7	1

[1] **Important:** SCR Bus Supplies are designed to be field maintained only. Normal maintenance components (fan, fuses, fuse monitor switch, printed circuit boards (precharge, gate, and snubber), and precharge relay are available. Additional catalog numbers are provided for troubleshooting and technical support information only.

[2] Extensive disassembly is required to replace the fan assembly. Please consider using Rockwell Automation Remanufacturing Services.

[3] When replacing these fuses, always properly position them so that their fuse trip indicators (plungers) point toward the fuse trip detection board.

[4] This is an ESD sensitive component.

600A SCR Bus Supply

Important: SCR Bus Supplies are NOT designed to be field repaired, but can be field maintained.

Figure A.9 600A Unit Spare Part Locations

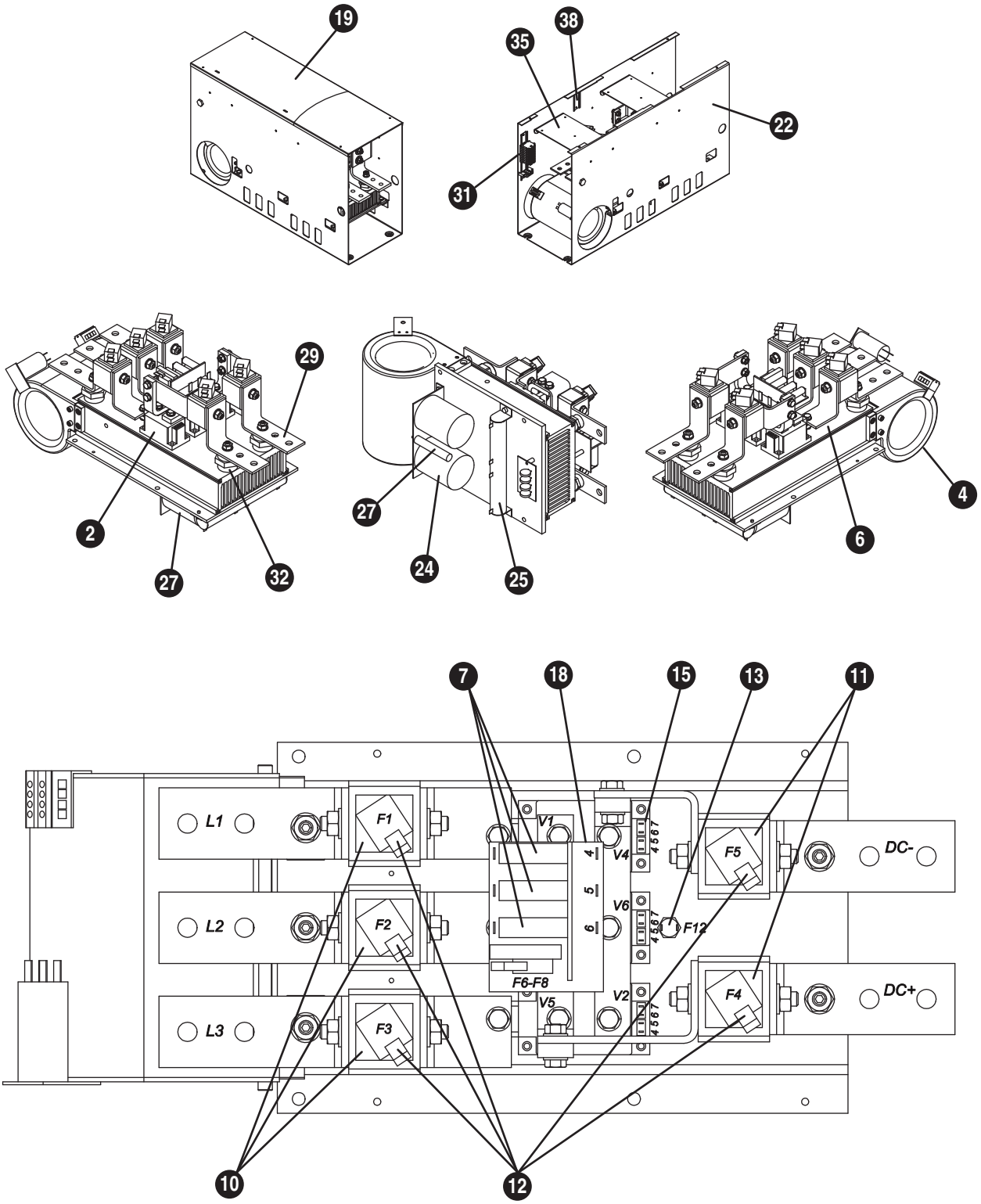


Table A.F 600A Unit Spare Part Numbers/Descriptions

Item	Availability [1]	Description	Rockwell Catalog No.	Qty.
2	—	600A SCR Set	SK-20S-MCC312-18IO1	3
4	Yes	Fan Assembly [2]	SK-D9-FAN2	1
6	—	400A and 600A MOV Assembly	SK-20S-VBKSDK041	1
7	Yes	40A Fuse (Precharge fuses F6…F8) [3]	SK-20S-F070B040S or Westcode Type F070B040S or Ferraz Shawmut Type 6.921CPgRC14.51 40	3
10	Yes	630A, 700V Fuse (AC fuses F1…F3) Torque to 25 N•m (221 lb•in).	SK-20S-069UR5S0630B or Westcode Type 069UR2S0630B or Ferraz Shawmut Type 6.9URD32TTF0630	3
11	Yes	1000A, 700V Fuse (DC fuses F4 and F5) Torque to 25 N•m (221 lb•in).	SK-20S-069UR2S1000B or Westcode Type 069UR2S1000B or Ferraz Shawmut Type 6.9URD32TTF1000	2
12	Yes	Fuse Monitoring Switch	SK-20S-MS3V1-5	5
13	—	85 °C Thermostat	SK-20S-SWT85KSDKRW	1
15	—	600A SCR Wire Harness	SK-20S-ZY065-600	1
18	Yes	400 and 600A Snubber Circuit Board	SK-20S-PR-GR3	1
19	—	600A and 1000A Cover	SK-20S-RW9582300-A	1
22	—	600A and 1000A Enclosure	SK-20S-RWU600-1000	1
24	—	10 µF, 1200V Capacitor	SK-20S-E62K85103D1W	2
25	—	5.6K Ohm, 90W Resistor	SK-20S-RW35FST5K6K	2
27	—	4.7 Ohm, 45W Resistor	SK-20S-RW33FST4R7K	1
29	—	600A Bus Bar Set	SK-20S-BBKSDK065	1
31	—	Terminal Block Assembly	SK-20S-TBKSDKRW	1
32	—	40 mm tall x 40 mm O.D. Insulator with M10 Thread	SK-20S-IN551520	5
35	Yes	480V SCR Precharge Circuit Board [4]	SK-D9-SCRPRE1-D	1
38	Yes	Precharge Relay	SK-20S-CA2KN31F7	1

[1] **Important:** SCR Bus Supplies are designed to be field maintained only. Normal maintenance components (fan, fuses, fuse monitor switch, printed circuit boards (precharge, gate, and snubber), and precharge relay are available. Additional catalog numbers are provided for troubleshooting and technical support information only.

[2] Extensive disassembly is required to replace the fan assembly. Please consider using Rockwell Automation Remanufacturing Services.

[3] When replacing these fuses, always properly position them so that their fuse trip indicators (plungers) point toward the fuse trip detection board.

[4] This is an ESD sensitive component.

1000A SCR Bus Supply

Important: SCR Bus Supplies are NOT designed to be field repaired, but can be field maintained.

Figure A.10 1000A Unit Spare Part Locations

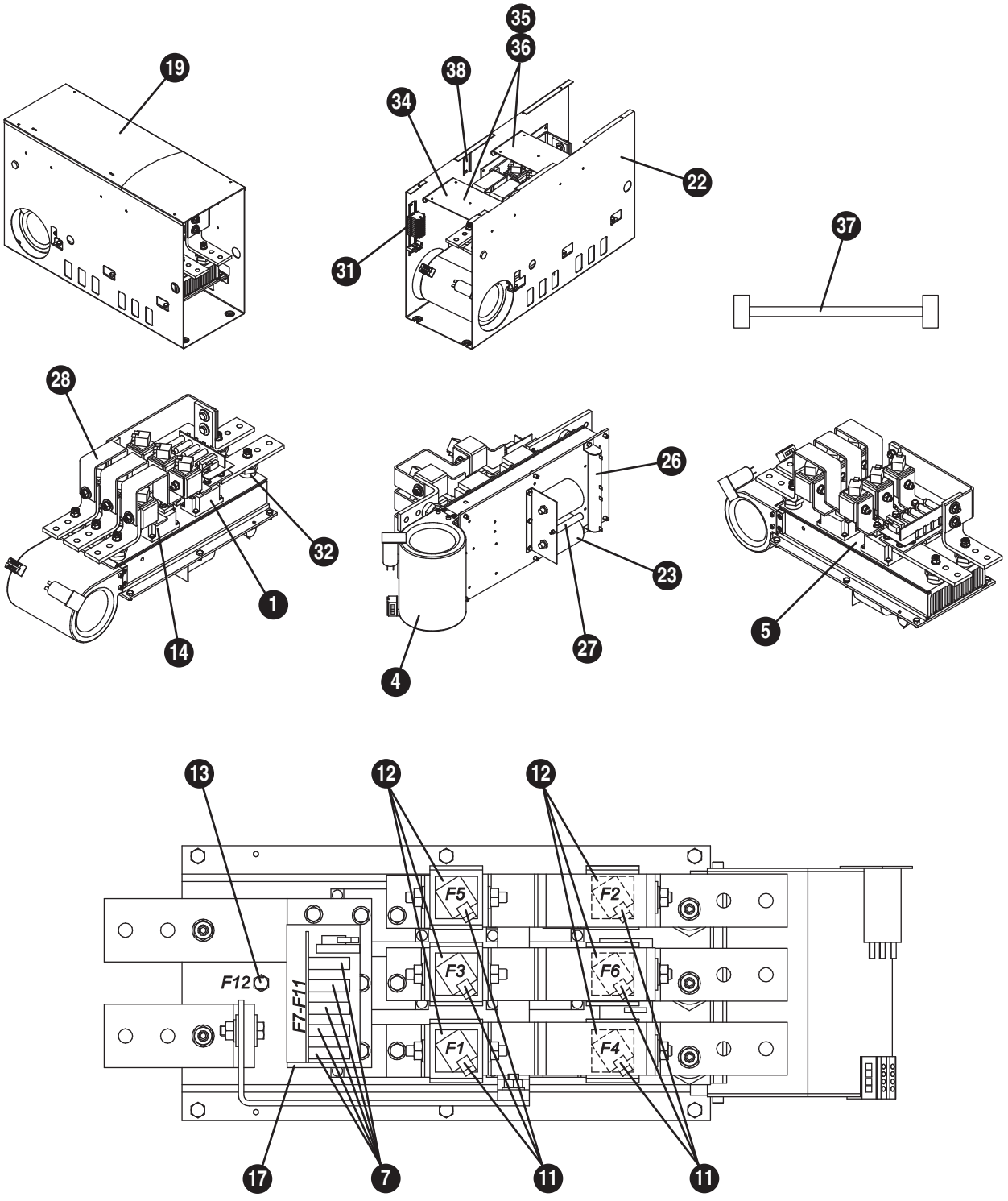


Table A.G 1000A Unit Spare Part Numbers/Descriptions

Item	Availability [1]	Description	Rockwell Catalog No.	Qty.
1	—	1000A SCR Set	SK-20S-MCO600-22IO1	6
4	Yes	Fan Assembly [2]	SK-D9-FAN2	1
5	—	1000A MOV Assembly	SK-20S-VBKSDK110	1
7	Yes	40A Fuse (Precharge fuses F7…F11) [3]	SK-20S-F070B040S or Westcode Type F070B040S or Ferraz Shawmut Type 6.921CPgRC14.51 40	5
11	Yes	1000A, 700V Fuse (AC fuses F1…F6) Torque to 25 N•m (221 lb•in).	SK-20S-069UR2S1000B or Westcode Type 069UR2S1000B or Ferraz Shawmut Type 6.9URD32TTF1000	6
12	Yes	Fuse Monitoring Switch	SK-20S-MS3V1-5	6
13	—	85 °C Thermostat	SK-20S-SWT85KSDKRW	1
14	—	1000A SCR Wire Harness	SK-20S-ZY110-1000	1
17	Yes	1000A Snubber Circuit Board	SK-20S-PR-GR3-5	1
19	—	600A and 1000A Cover	SK-20S-RW9582300-A	1
22	—	600A and 1000A Enclosure	SK-20S-RWU600-1000	1
23	—	15 µF, 1000V Capacitor	SK-20S-E62K85153D1W	2
26	—	4.7K Ohm, 130W Resistor	SK-20S-RW36FST4K7K	2
27	—	4.7 Ohm, 45W Resistor	SK-20S-RW33FST4R7K	1
28	—	1000A Bus Bar Set	SK-20S-BBKSDK110	1
31	—	Terminal Block Assembly	SK-20S-TBKSDKRW	1
32	—	40 mm tall x 40 mm O.D. Insulator with M10 Thread	SK-20S-IN551520	5
34	Yes	Gate Driver Circuit Board [4][5]	SK-D9-SCRGDB1	1
35	Yes	480V SCR Precharge Circuit Board [4][6]	SK-D9-SCRPRE1-D	1
36	Yes	690V SCR Precharge Circuit Board [4][6]	SK-D9-SCRPRE1-F	1
37	Yes	Master/Slave or Slave/Slave Wire Harness [7]	SK-20S-D9-CBL1-DF	1
38	Yes	Precharge Relay	SK-20S-CA2KN31F7	1

[1] **Important:** SCR Bus Supplies are designed to be field maintained only. Normal maintenance components (fan, fuses, fuse monitor switch, printed circuit boards (precharge, gate, and snubber), and precharge relay are available. Additional catalog numbers are provided for troubleshooting and technical support information only.

[2] Extensive disassembly is required to replace the fan assembly. Please consider using Rockwell Automation Remanufacturing Services.

[3] When replacing these fuses, always properly position them so that their fuse trip indicators (plungers) point toward the fuse trip detection board.

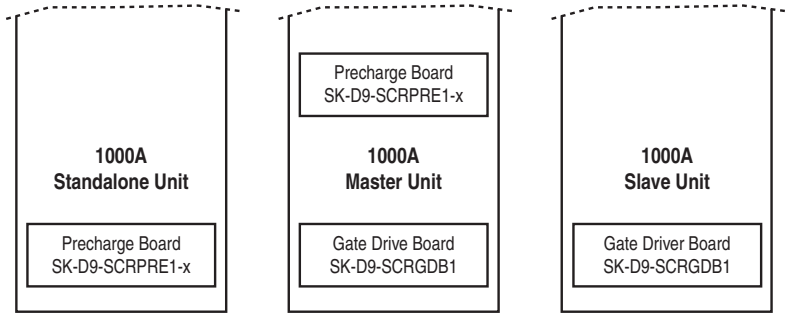
[4] This is an ESD sensitive component.

[5] Not required for 1000A Standalone unit, but required for 1000A Master unit or 1000A Slave unit (both mounted in lower location).

[6] Not required for 1000A Slave unit, but required for 1000A Standalone unit (mounted in lower location) or 1000A Master unit (mounted in upper location).

[7] Not required for a 1000A Standalone unit, but required to connect an existing 1000A Master or Slave unit to another 1000A Slave unit (gate driver circuit board mounted in lower location).

Figure A.11 1000A Unit Printed Circuit Board Locations (top view)



Notes:

History of Changes

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This appendix summarizes the revisions to this manual. Reference this appendix if you need information to determine what changes have been made across multiple revisions. This may be especially useful if you are deciding to upgrade your hardware or software based on information added with previous revisions of this manual.

20S-UM001F-EN-P, March 2011

Change
Reformatted document from half size (5.5 x 8.5 in.) to full size (8.5 x 11 in.).
Removed reactors by DC Bus outputs on 12-Pulse System Configuration drawing.
Added Atmosphere specification to the Environmental section.
Added Surrounding Environment specification to the Environment section.
Revised 400A, 600A, and 1000A Bus Supply spare part drawings and related tables.
Added index to User Manual.

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Rockwell Otomasyon Ticaret A.Ş., Kar Plaza İş Merkezi E Blok Kat:6 34752 İçerenköy, İstanbul, Tel: +90 (216) 5698400

www.rockwellautomation.com

Power, Control and Information Solutions Headquarters

Americas: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444
Europe/Middle East/Africa: Rockwell Automation, Pegasus Park, De Kleetlaan 12a, 1831 Diegem, Belgium, Tel: (32) 2 663 0600, Fax: (32) 2 663 0640
Asia Pacific: Rockwell Automation, Level 14, Core F, Cyberport 3, 100 Cyberport Road, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

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